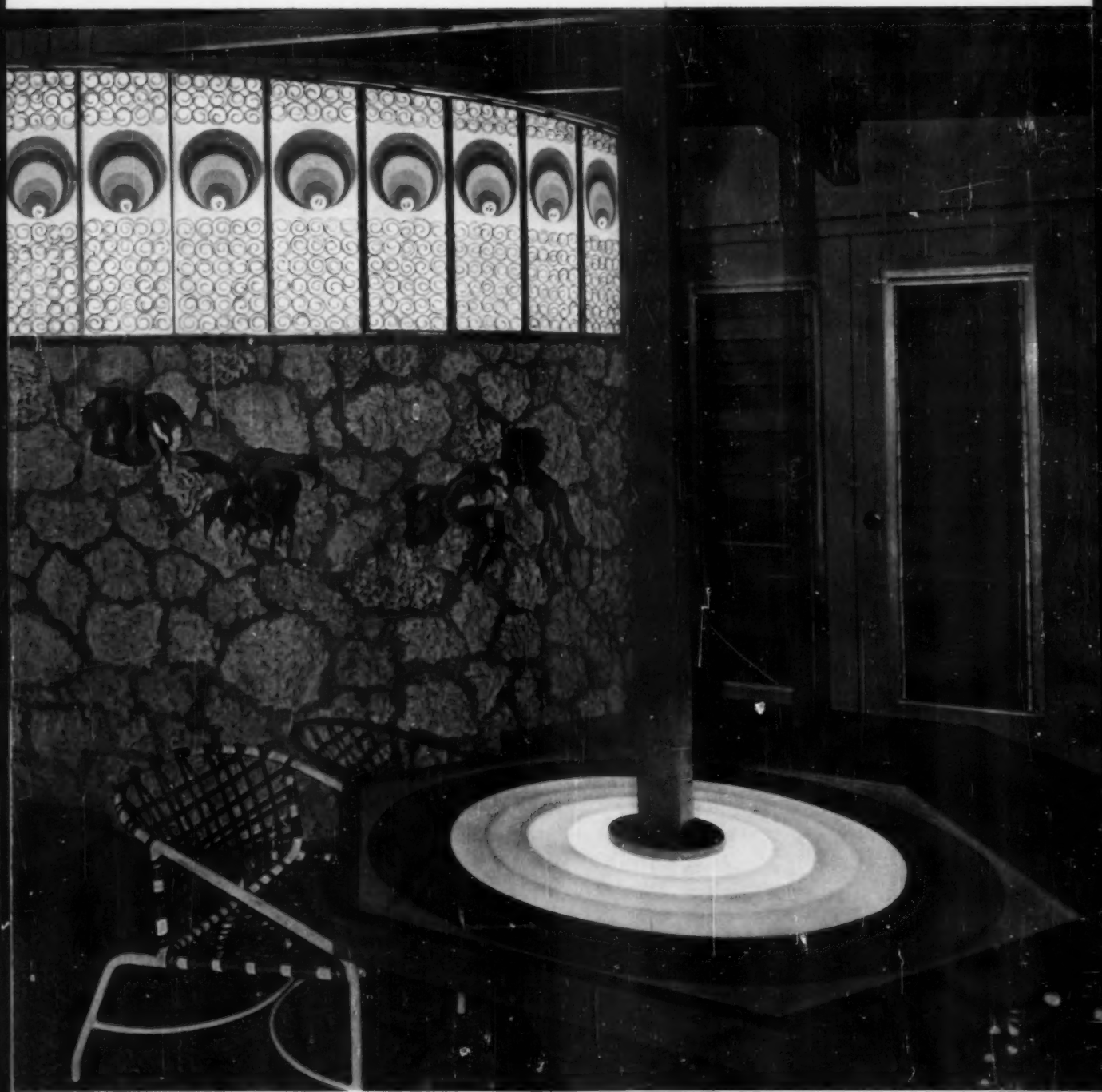
# MODERN PLASTICS

SEPTEMBER 1959



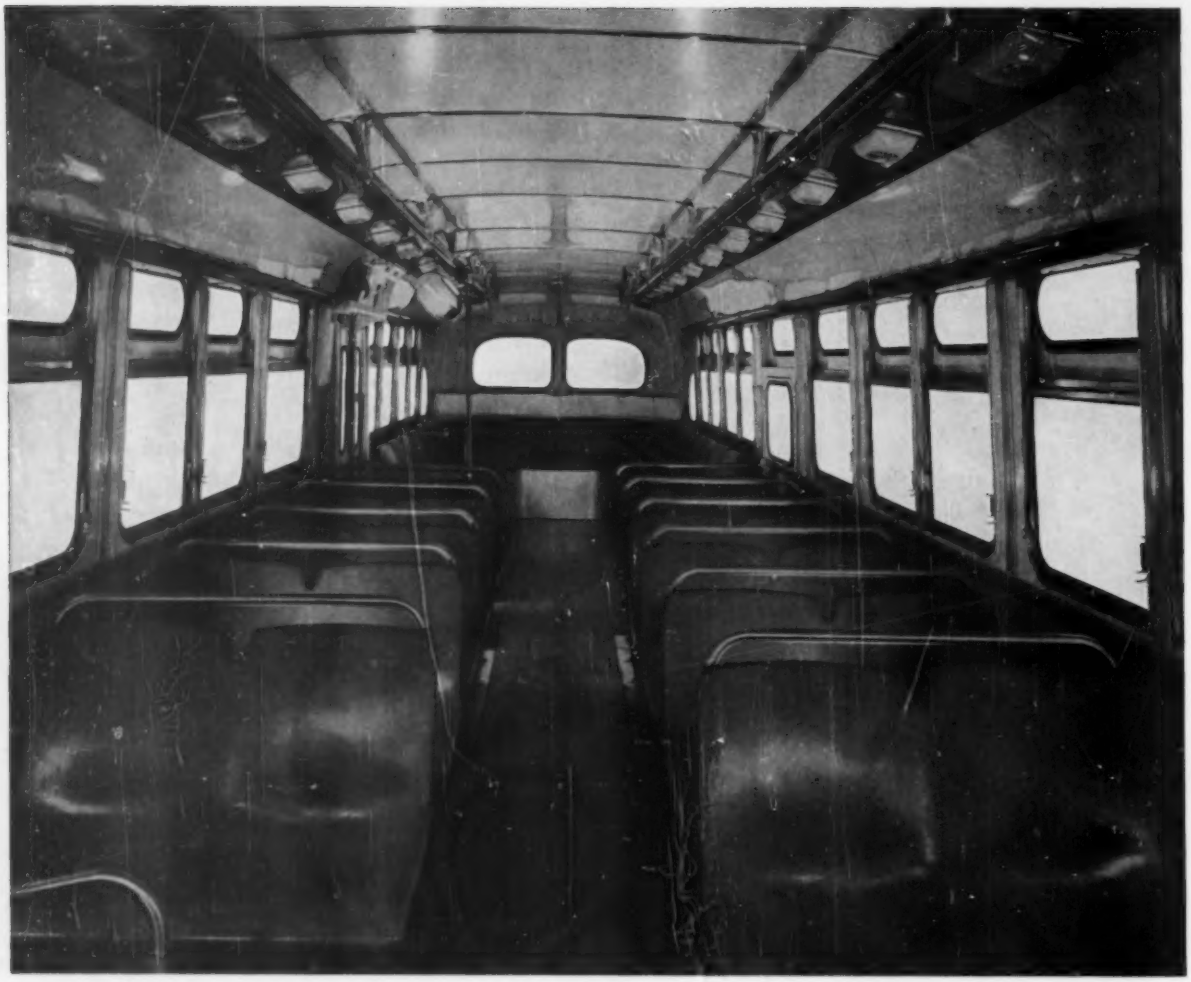
**For more beautiful buildings—new decorative sandwich panels** *p. 88*

**What about flame resistance in plastics?** *p. 81*

**SPECIAL REPORT: Plastics in housewares** *p. 212*

**How one mile of RP insulates the DC-8** *p. 102*

**Which polystyrenes for illumination?** *p. 134*



# COSTS SLICED—NOT SEATS!

Vandals used to carve a $100,000-a-year slice out of a big city's transit budget.

Switchblade artists literally ripped the stuffings out of upholstered bus seats. When the hoodlums rested, daily wear and tear kept on working. Seams gaped, springs popped, cover material cracked.

Then the city transit authorities ordered 330 new buses with glass-reinforced plastic seats like the ones you see here. Made with tough, fire-retardant Hetron® polyester, these seats can't be slashed, defy damage. There are no seams, no springs, no cover materials to cause trouble.

Even including the cost of metal dies, these seats cost less to make than upholstered seats. *And the passengers like them better* —voted overwhelmingly in favor of them in rider reaction tests. Transit officials plan to replace *all* the city's buses with vehicles featuring these vandalproof seats.

### Retards fire

Where can *you* save money—or make money—with strong reinforced-plastic shapes that retard fire? There's a whole family of Hetron resins to help you. Hetron is *inherently* self-extinguishing —gives you fire retardance with no loss of mechanical strength. Heat resistance, moisture resistance, electrical properties of Hetron laminates and premix-molded shapes are outstanding.

To get a better idea of what you can do with these versatile resins, write now for the complete Hetron data file.

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**MATCH-METAL-MOLDED SEAT** employs ten pounds of Hetron in ratio of 45% resin, 25% glass, and 30% filler.

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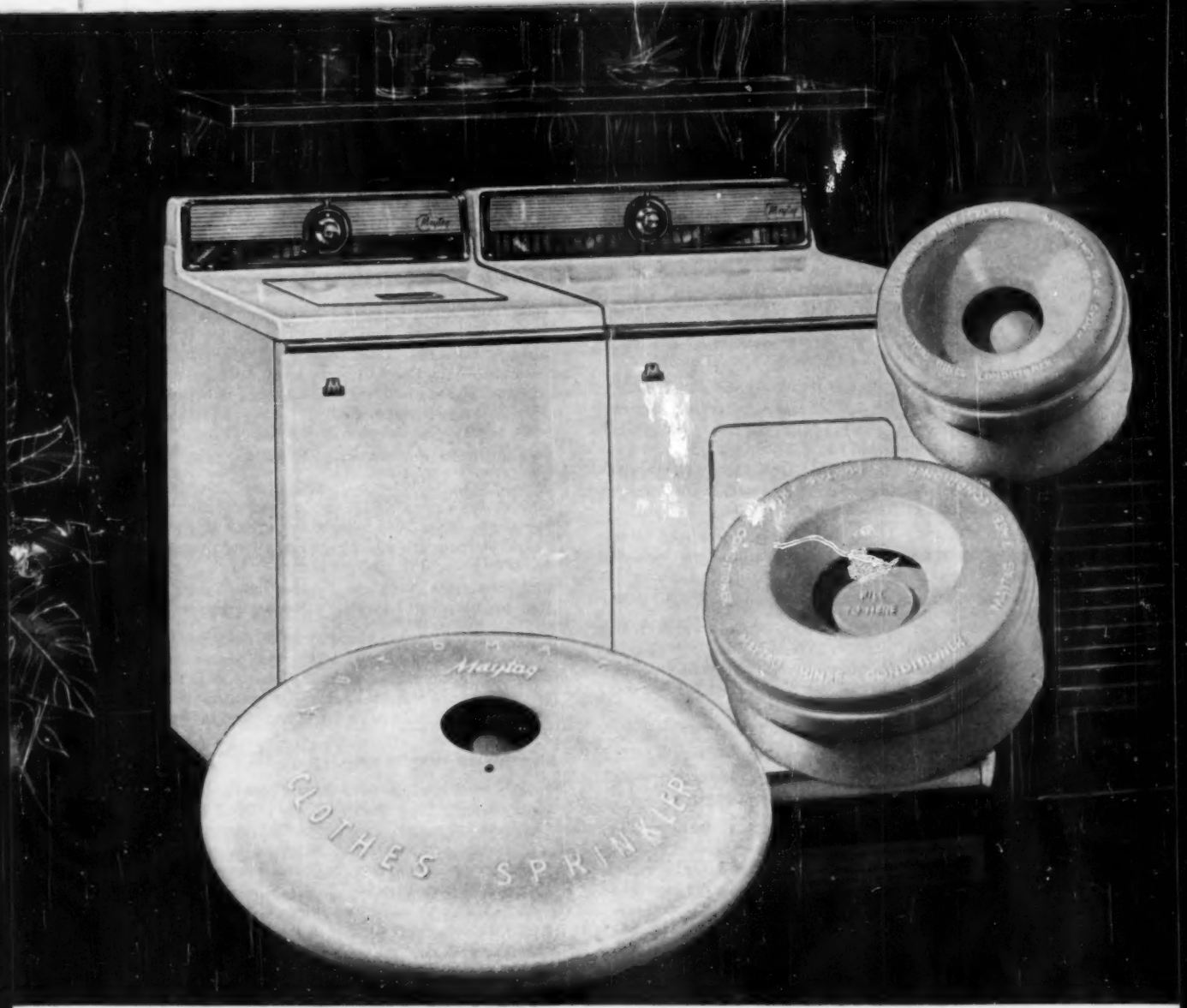


## For a long, rugged service life, these MAYTAG components are molded of

### HEAT RESISTANT – HIGH IMPACT *Catalin* STYRENE

MAYTAG, in engineering its handsome, new line of feature-packed automatic washers and dryers . . . developed an automatic clothes sprinkler and an automatic rinse conditioner that was a natural for plastics. After investigating and testing various compounds . . . their molder, Artag Plastics Corp., selected CATALIN Heat Resistant, High Impact STYRENE as the formulation that possessed all the properties necessary to meet Maytag's quality standards.

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| Modulus in tension, x $10^5$, psi. | D638-52T | 4.0 |
| Impact strength, ⅛" bar, ft. lbs./in. of notch | D256-54T | 2.4-3.4 |
| Flexural strength, ⅛" bar, psi. | D790-49T | No failure |
| Heat distortion, °F., Annealed | D648-45T | |
| ½" x ½" bar | | 205 |
| ¼" x ½" bar | | 205 |
| ⅛" x ½" bar | | 203 |
| Flammability, ⅛" bar, in./min. | D635-44 | 1.1-1.3 |
| Rockwell hardness, "M" | D785-51 | 51 |
| Specific gravity | D792-50T | 1.04 |
| Dielectric constant, $10^6$ cycles | D150-54T | 2.5 |
| Dissipation factor, $10^6$ cycles | D150-54T | 0.0010-0.0015 |
| Thermal coefficient of expansion, in./in./°C. | D696-44 | 8-10 x $10^{-5}$ |

*Component parts custom molded for The Maytag Company by Artag Plastics Corporation, Chicago 18, Illinois*

**Catalin Corporation of America** Catalin **One Park Avenue, New York 16, N. Y.**

MODERN *

## • THE PLASTISCOPE

**Section 1** ..... **37**

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Special report on latest plastics applications in housewares (p. 212); polyethylene resin sales reach new heights (p. 43); extruded thermoplastic netting (pp. 39, 41); all-plastics plumbing system includes hot-water lines (p. 220); ABS applications in Italian cars. (p. 228).

## • EDITORIAL

**Lessons from cellophane** ..... **268**

With a dozen makers of film grade polyethylene resin and about 100 film extruders, uniform standards are hard to come by. Cellophane makers achieved this about 25 years ago. Here's what the plastics industry must do today.

## • GENERAL

**What about flame resistance in plastics?** **81**

Ever since U/L published its famous Bulletin 484 earlier this year, there have been loud clamors for a flame resistant plastic to meet the various specs that have been developed. Here is a rundown on the existing standards, codes, regulations, tests—some good, some bad—and a thorough explanation of what's really involved in trying to make plastics "fireproof," together with a report on what the plastics industry has done and is doing about this problem.

**How to make better lint filters** ..... **85**

Three manufacturers of laundry equipment have turned to molded thermoplastics for these components in their washers and dryers. Reason: a better product at savings up to 75 percent. Design advantages gained from the switch to plastic are spelled out and production details are given.

**These fabulous panels** ..... **88**

Today's architects, searching for new design ideas, have now available a decorative sandwich panel with built-in beauty, strength, and economy. Translucent RP faces and a variety of core materials (including wood curls, paper honeycombs, metal separators, and others) combine into an almost limitless kaleidoscope of patterns and colors. Applications include both residential and institutional structures. Full color illustrations of actual design are featured.

**Premix licks corrosion, cuts costs, too.** **93**

How a manufacturer of portable paging units effected savings of 25% in materials alone by switching from fabricated sheet metal to molded polyester premix, and at the same time was able to solve several design problems.

**For lower model costs: silicone rubber** **94**

Room-temperature curing system makes possible production of epoxy prototypes at a fraction of the cost of other methods. Actual case histories tell of savings achieved. Step-by-step instruction on how the molds can be made and used are given.

**Everybody needs epoxies** ..... **96**

Numbers 8 and 9 in our continuing series of epoxy applications deal with the field of building. Covered are masonry coatings, floor topping, paving compounds, pipe, and patching formulations, with special attention to laminate panels for severe environments:

**Building—bright future for epoxies** .. **96**

**Epoxy panels—lightweight, stronger** . **99**

**PVC ducts save** ..... **101**

A switch from metal to vinyl for the venting ductwork in a cigarette-lighter factory resulted in a five-fold increase in service life, elimination of all maintenance problems.

**Ingenious insulation for jets** ..... **102**

Important savings in heat cost and 50% more fatigue resistance than equivalent aluminum sections are provided by unusual reinforced plastics part. Over a mile of it is used per jet. Tricky production problems and how they were overcome are described in detail. Because of its effectiveness, the insulation has already invaded other fields, such as truck bodies.

**Modern Plastics Executive and Editorial Offices:** 575 Madison Avenue, New York 22, N.Y. Please mail all correspondence, change of address notices, subscription orders, etc., to above address. Quotations on bulk reprints of articles appearing in this issue are available on request.

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# PLASTICS*

SEPTEMBER 1959
Volume 37 Number 1


## • ENGINEERING


**Injection molding: a rheological interpretation—Part 1 . . . . . 105**

This is the first basic quantitative study of what is involved in filling a cold cavity with a hot polymer melt. It aims at a better understanding—in terms of rheological and thermal properties of polymers—of the injection molding process. This month's article discusses preliminary experiments, theory, and the experimental problem. Part 2, to appear in October, will give results. *By R. L. Ballman and H. L. Toor.*

**Problems with premix molding: Part 4 . 112**

What to do about poor fill, deflashing, small parts, and mold maintenance. This is the concluding article in the series on better premix molding. *By R. B. White and R. S. Jackson.*


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**Polystyrene for lighting fixture use . . 134**

What are the best tests to predict accurately the efficiency of ultraviolet stabilizers and antioxidants in polystyrene formulations used in light fixtures? *By P. H. Estes, E. R. Smith, P. C. Woodland, and E. W. Veazey.*

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Recommendation of the Illuminating Engineering Society, developed in cooperation with S.P.I., of standards for light stable polystyrenes.

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### Coming Up . . .

As previously announced, at least two articles on the growth of distribution systems for plastics products. First will run as October lead and will be concerned with semi-fabricated materials such as sheets, rods, tubes, films . . . First market presentation of polyvinyl fluoride film . . . A chart presenting what is available in self-extinguishing plastics materials today . . . Also in October Engineering Section a new extrusion concept called "Elastic melt extruder," in which no screw is used . . . A new approach to glazing for high-speed aircraft which can withstand heats up to 500° F. . . . November lead: a picture of upcoming markets for blow molding, particularly in the polyolefins . . . Vinyl-coated cable which weighs much less than previous cables, is more efficient, of great importance in theaters, television studios, and mines . . . In November also a comprehensive article on chill-extrusion-cast polyethylene film . . . December lead will present latest developments in specialty phenolics.


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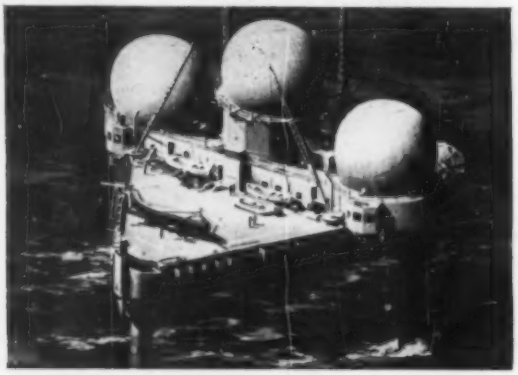
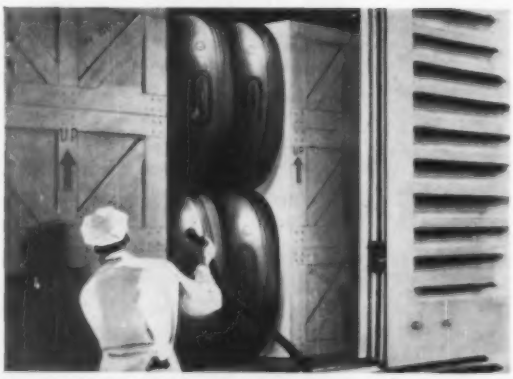
# AIR-SUPPORTABLES



"Texas Tower" radomes of rubberized nylon are supported by interior air pressure. Nylon base fabric by Wellington Sears.

# INFLATABLES



Inflatable dunnage bags are made of neoprene-coated nylon enclosing rubber air chamber. Wellington Sears base fabric.

# COLLAPSIBLES

Collapsible fuel tank, made of rubberized nylon fabric, is a filling station dropped from the air. Base fabric by Wellington Sears.

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Geon polyvinyl materials are being used for many kinds of coating applications—from metal and glass, to paper and textiles. Geon is a versatile material and is available in many forms for servicing many industries. Rigid vinyl pipe, electrical insulation, house siding and coated steel paneling are only a very few of the many products Geon serves so well. For help on your product idea, write Dept. AF-7, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

New automatic dishwasher-dryers manufactured by Waste King Corporation, have a tough, resilient, and colorful lining formulated by Michigan Chrome & Chemical Company, Detroit. B.F.Goodrich Chemical Company supplies the Geon polyvinyl material.

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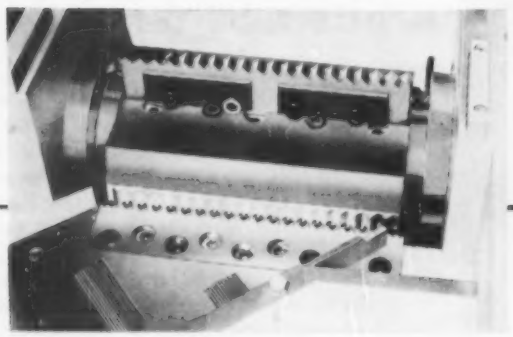

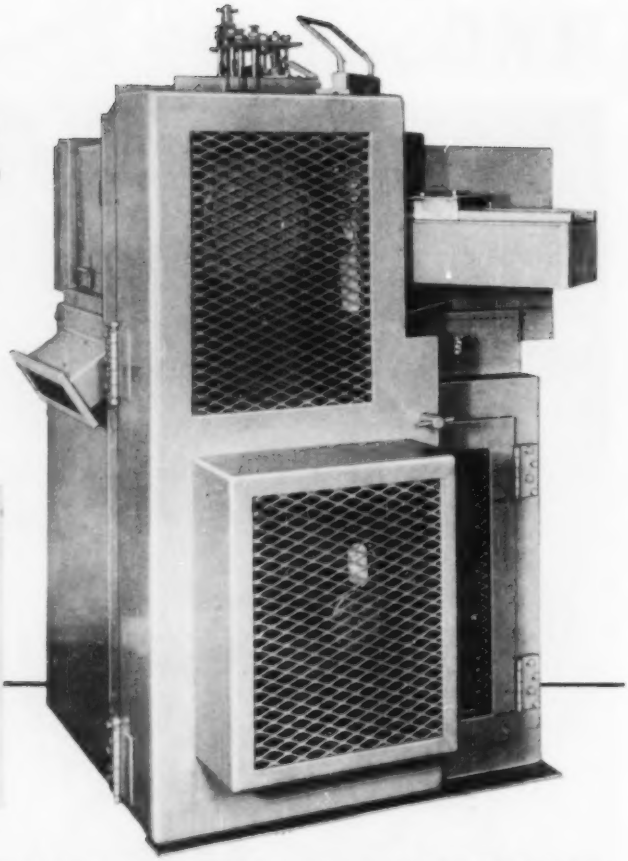

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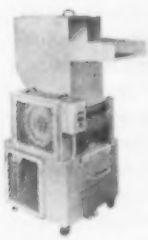

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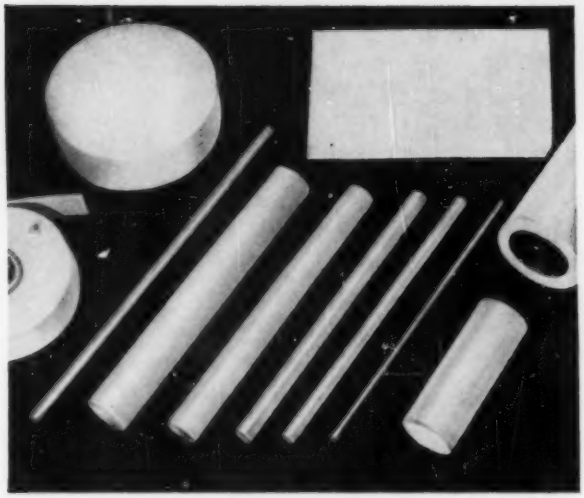

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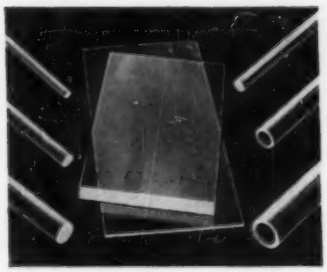

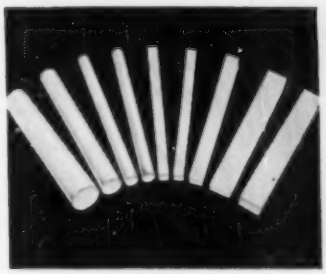

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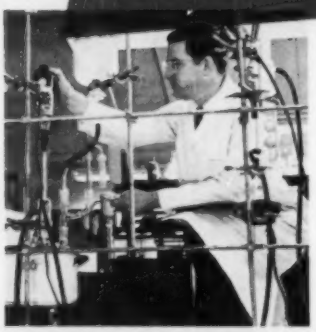

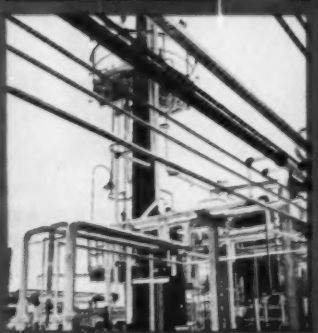

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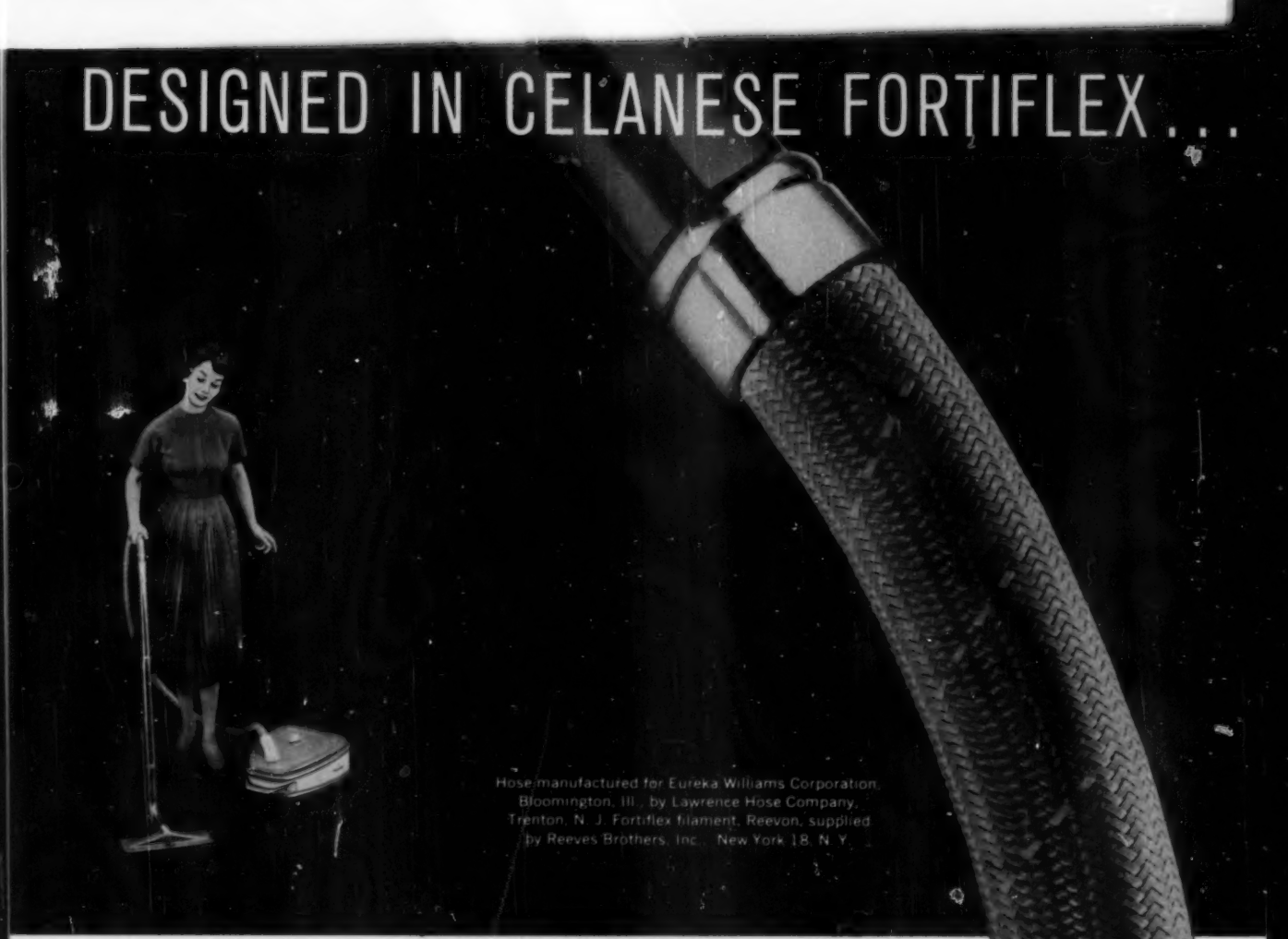
# DESIGNED IN CELANESE FORTIFLEX...



Hose manufactured for Eureka Williams Corporation, Bloomington, Ill., by Lawrence Hose Company, Trenton, N. J. Fortiflex filament, Reevon, supplied by Reeves Brothers, Inc., New York 18, N. Y.

## Hose armored with Fortiflex filament helps Eureka make tough cleaning jobs go lightly

Because the outer braid is woven of Celanese Fortiflex filament, this hose is strong and abrasion-resistant. It's easier to use—lighter, more flexible—thanks to the thin wall section made possible by the high strength of Fortiflex. Smooth, colorful, with a handsome pattern in the weave and a surface that is easily cleaned, this hose typifies the advantages Fortiflex filament has to offer designers.

Fortiflex, a linear polyethylene, has much greater stiffness, hardness, strength and heat-resistance than the chemically-similar soft polyethylenes. For example, it can be sterilized in boiling water. Filaments drawn from this material have high tensile strength, toughness and durability. The high tenacity of the filament is partly due to a multiple stretching process. This orients the molecules, aligning them in the direction of stress. The high strength of the filament is accompanied by low elongation and excellent low-temperature resistance. Here is a design material which is ideal for making hoses, automotive seat covers, outdoor furniture webbing,* industrial filter cloths, fishing nets* and many other products.

Celanese supplies Fortiflex plastic for further processing into fibers. We'll be glad to put you in touch with manufacturers who produce and sell the filament, and we welcome inquiries as to properties and applications of Fortiflex filament. Simply clip and send us the coupon at right.

Celanese® Fortiflex®

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(12-mil gauge)

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|---|---|
| Specific Gravity | 0.950 to 0.960 |
| Tenacity (grams/denier) | 4.5 to 8.0 |
| Tensile Strength, psi | 55,000 to 100,000 |
| Elongation, per cent | 14 to 30 |
| Knot Strength, psi | 40,000 |
| Loop Strength, psi | 60,000 |
| Water Resistance | Excellent |
| Ultraviolet Stability | Good* |

*When properly pigmented and stabilized

**Fortiflex...a Celanese plastic**

*Canadian Affiliate:* Canadian Chemical Company Limited, Montreal, Toronto, Vancouver.
*Export Sales:* Amcel Co., Inc., and Pan Amcel Co., Inc., 180 Madison Avenue, New York 16.

Celanese Corporation of America, Plastics Division,
Dept. 101-S, 744 Broad Street, Newark 2, N. J.

Please send ☐ More information on Fortiflex filament.
☐ Names of manufacturers.

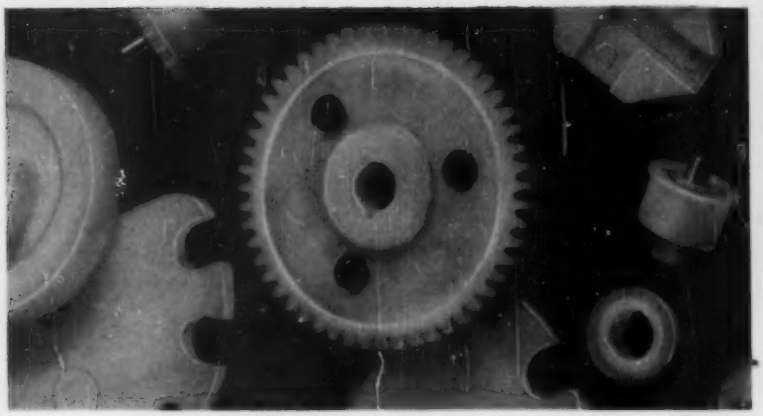
Name_____

Title_____

Company_____

Address_____

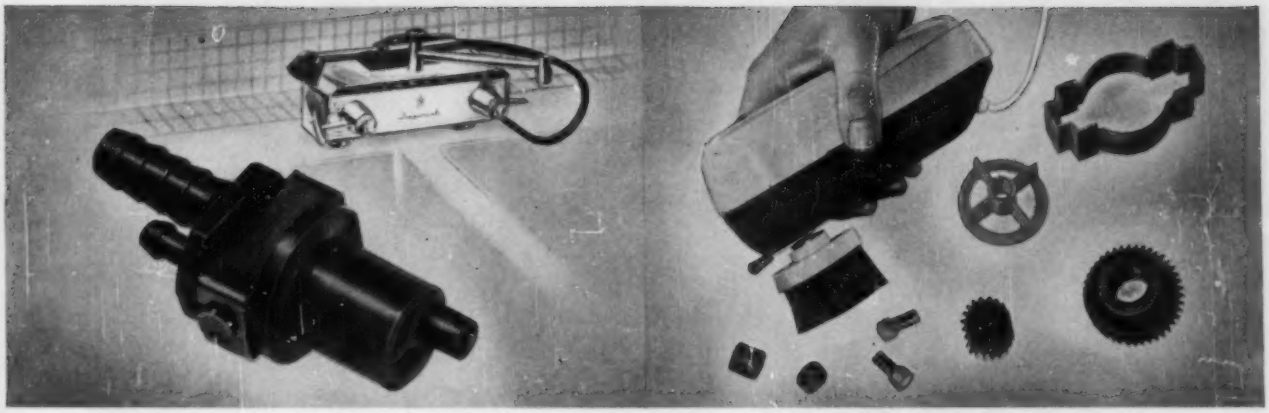
City_____ State_____



**X-RAY** film processing machine employs gears and other parts of ZYTEL nylon resin. Unharmed by photographic chemicals, these parts offer many economies in manufacture and use. (Made by Brook Molding Corp., Norwood, Mass., for Eastman Kodak Co., Rochester, N. Y.)

**HARDWARE** — Blocks made of ZYTEL nylon resin prove their high strength under heavy loads. They resist the elements almost indefinitely and require little or no lubrication. (Molded by Danielson Mfg. Co., Danielson, Conn., for Boston and Lockport Block Co., Inc., East Boston, Mass.)

**SPORTING GOODS** — New Remington 22 is the first rifle with a structural-nylon stock. Made of ZYTEL nylon resin, the stock is chip-proof, waterproof, oilproof, and light in weight. Stock comes in two colors. (Nylon 66 autoloading 22 rifle by Remington Arms Company, Inc., Bridgeport 2, Conn.)



**DISHWASHER** uses mixing valve of ZYTEL, replacing 1 brass and 3 copper parts at a considerable saving. Chemical resistance of valve eliminates clogging, sticking and deterioration of joints by detergent-water mixture. (By MacDonald Mfg. Co., New Baltimore, Mich., for Manville Mfg. Corp., Pontiac, Mich.)

**ELECTRIC SHOE POLISHER** has 8 lightweight components of ZYTEL nylon resin. The accurate molded parts provide quiet operation, temperature resistance, low operating friction. Parts of ZYTEL also have excellent resistance to wear and abrasion. (Manufactured by Ronson Corp., Woodbridge, N.J.)

# 5 examples show how Du Pont ZYTEL® NYLON RESINS make new products possible . . . existing products better . . .

By itself, the combination of mechanical, chemical and electrical properties offered by ZYTEL nylon resins opens new opportunities for making products better at lower cost. But in addition to corrosion, temperature and abrasion resistance, strength and colorability, the versatile family of ZYTEL resins offers ease of fabrication and cost savings. Because ZYTEL resins can be molded to high tolerances in intricate shapes, they often make possible the replacement of several parts of different materials by a single part. Result: reduced material, assembly and inspection costs.

Find out more about the properties and processing characteristics of the many available formulations of ZYTEL nylon resins. This information may well have a direct bearing on your profits as a molder or user of plastics. For design and property data write to: E. I. du Pont de Nemours & Co. (Inc.), Advertising Department, Room Z-299, Nemours Building, Wilmington 98, Delaware. *In Canada:* Du Pont of Canada Limited, P.O. Box 660, Montreal, Quebec.

**POLYCHEMICALS DEPARTMENT**

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*These transparent 'Perspex' shelf dividing sheets in a Montreal supermarket allow goods to be clearly displayed.*

## Choose 'Perspex' for clear, clean, visible displays

THIS DISPLAY of tinned baby foods in a Montreal supermarket owes much of its impact to its use of 'Perspex' acrylic sheet. Because of 'Perspex' the goods can be clearly seen — and that means more goods sold. 'Perspex' is easy to keep clean and maintain and it is a material which remains attractive throughout many years of use.

It's a strong material, a light one and, so important wherever food is handled, 'Perspex' is a completely hygienic material. It's good to work with, easy to shape. 'Perspex' is available in a wide range of transparent, translucent and opaque colours as well as in clear and opal sheet.

**'PERSPEX'**

*'Perspex' is the registered trade mark for the acrylic sheet manufactured by I.C.I.*

**Imperial Chemical Industries Limited, Plastics Division: Export Dept., Black Fan Road, Welwyn Garden City, Herts.**

*U.S.A. enquiries to :*
J. B. Henriques Inc., 521 Fifth Avenue, New York 17, N.Y.

*Canadian enquiries to :*
Canadian Industries Ltd., Plastics Division, Box 10, Montreal, P.Q.

ICI

P.661/0/A.

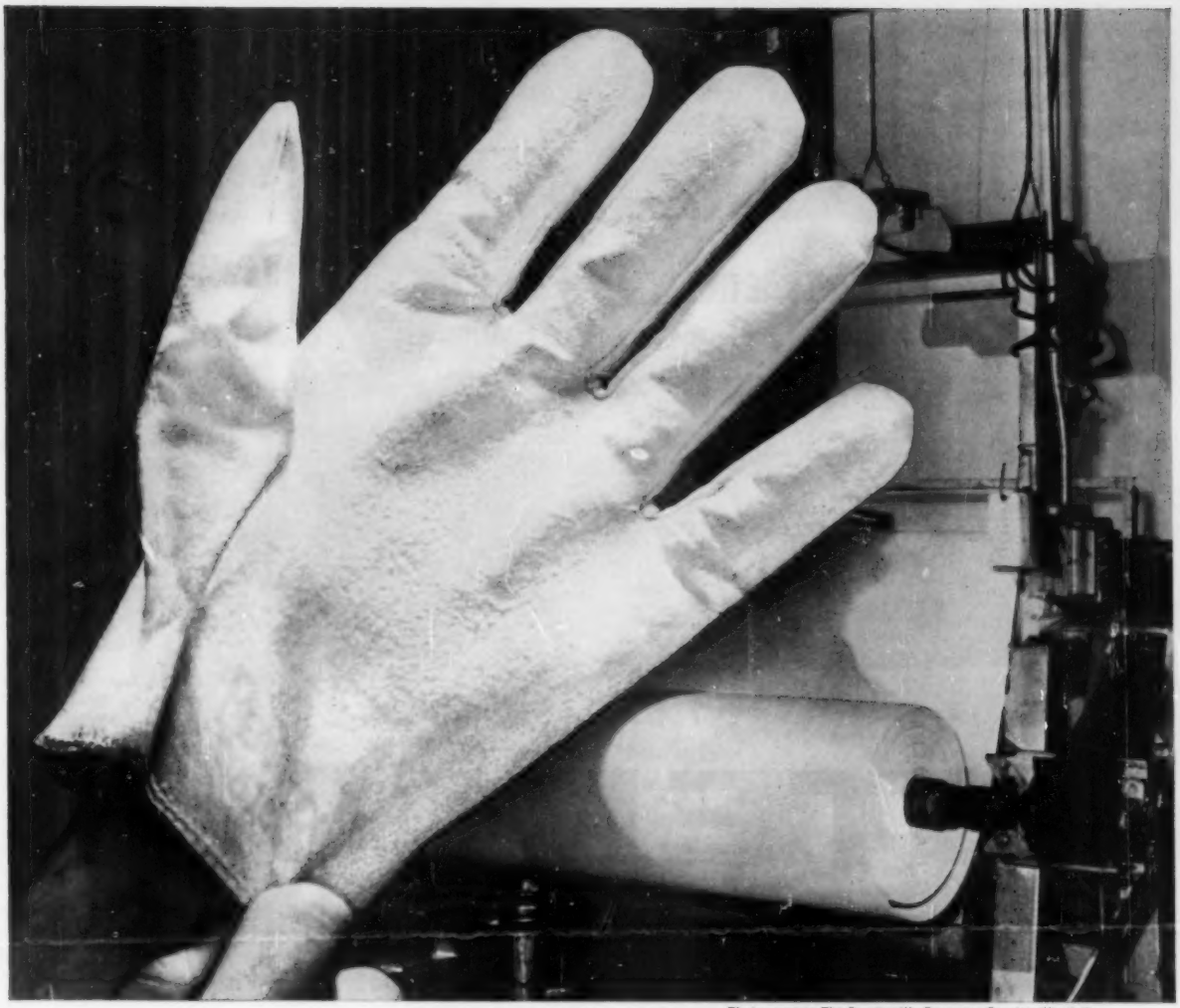


Photo courtesy The Graniteville Company, Graniteville, S. C.

# It gives gloves better "hand"

**Looks like suede**—feels like suede—but the work glove above is actually made of cotton. What gives this glove its unique suede-like appearance and better "hand"? Answer: it was knife-coated with a compound based on PLIOVIC AO, Goodyear vinyl chloride copolymer dispersion resin.

**In addition** to its distinctive texture, this new material will wear three to four times longer than uncoated fabrics and has exceptional "gripping power." Called Duro-Suede, it is now being produced for work gloves—may soon be used in work shirts and jackets, sports clothing and various industrial applications.

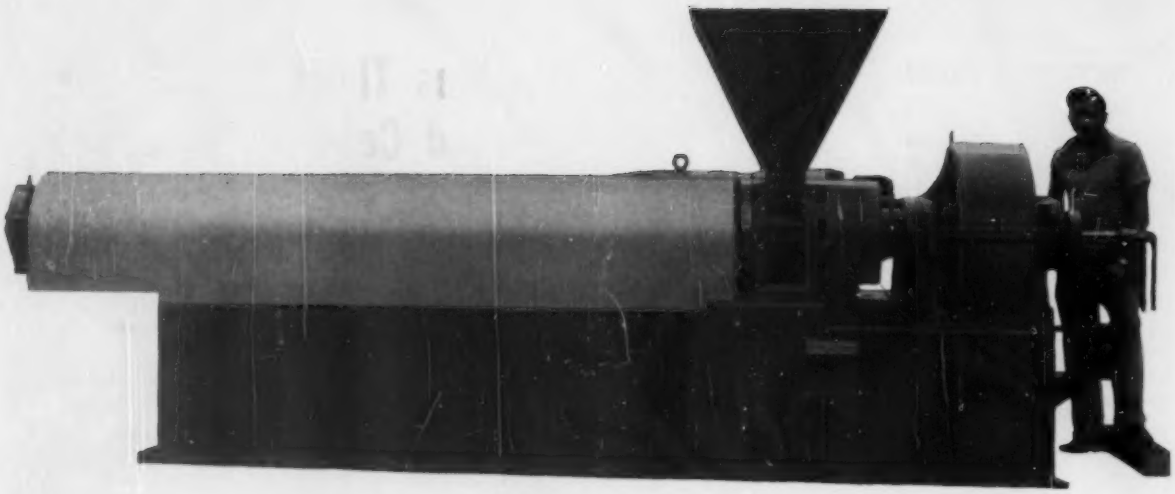
**PLIOVIC AO was chosen** for its low fusing temperature, excellent plasticizer compatibility, good viscosity characteristics and film texture. All of these properties contribute to ease of processing, efficient operation and outstanding product quality.

**Want to add** sales-building new properties to your product? PLIOVIC AO may help you do it. Write for complete information—including latest *Tech Book Bulletins*—to: Goodyear, Chemical Division, Dept. I-9422, Akron 16, Ohio.

GOODYEAR

CHEMICAL DIVISION

Pliovic—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio



# STERLING

This 6″ Sterling extruder will out-produce any comparable machine... precisely because it was designed to do so, to meet the purchaser's requirements. Sterling will build an extruder to **your** special requirements, whether they fall within conventional ranges or exceed them. Sterling Extruders are available in sizes of 1½″, 2″, 2½″, 3½″, 4½″ and 6″ with L/D ratios of 15:1, 21:1, 24:1 or 30:1. Also available are completely packaged units and installations for the production of tubing, film, sheeting, rods and shapes, and for compounding, coloring and laminating from a complete range of thermoplastic materials. For complete details, write directly to, or call, Mr. L. D. Yokana, President, Sterling Extruder Corporation, 1112 Baltimore Avenue, Linden, New Jersey. WAbash 5-3908.

# PRODUCTION

**STERLING EXTRUDERS** — *"Designed by plastics men for plastics men"*

# U.S.I. POLYETHYLENE NEWS

A series for plastics and packaging executives by the makers of PETROTHENE® polyethylene resins


## Packaging Notes

**New polyethylene bag-making machine** is capable of sealing polyethylene film up to 10 mil thick. The machine reportedly has better temperature control instrumentation than conventional machines. Sealing bar pressure is controlled pneumatically. Control of pre-dwell, dwell, and post-dwell times is by separate timers and the film is sealed in a completely relaxed state.

The machine can convert both blown tubing and flat film into bags. Its production rates are said to be comparable to other bag making machines.

---

**Wafer-thin snap fasteners for polyethylene envelopes** are now finding use in packaging retail soft goods. The fastener keeps the package closed, protecting the product, yet allows the customer to inspect the packaged product.

---

**Freeze-it-yourself popsicles** packaged in polyethylene-coated cellophane are now on the market in some parts of the country. The popsicles are sealed in pouches in liquid form for freezing at home. After freezing, the popsicles may be separated from each other and eaten by squeezing them out of the pouch. No sticks are needed. The film, cellophane with a 2-mil coating of polyethylene, is supplied in both printed and unprinted webs, generally four across for twin popsicles. The cellophane is printed before coating with polyethylene, locking in the printing.

---

**Label adhesive** for plastic surfaces is said to stick where average adhesives will not hold. It reportedly replaces pressure sensitive adhesives, which are slower and more costly to apply.

The adhesive is waterproof and permanently flexible. It will adhere to polyethylene, yet can easily be removed. The adhesive is applied by brush or automatic machine.

---

**Polyethylene toothpaste tube** has been developed. It is produced by an extrusion-injection molding method. A special coating is said to guard against loss of flavor and essential oils by permeation.

---

**New flexible polyethylene bag** with a sealed-in plastic tube serves as a "drink-from-the-package" container for fruit and vegetable juices, milk, soup, and soft drinks. The ready-to-use container simplifies disposal problems, speeds cooling, and is suitable for use

## U.S.I. Develops Three New Resins With Improved Coating Properties

### New PETROTHENE Resins Have Better Adhesion, Reduced Neck-in

U.S.I. has announced the availability of three new PETROTHENE polyethylene resins especially suited to paper coating. These new resins were developed in U.S.I.'s Polymer Service Laboratories and have successfully undergone extensive field testing.

The new resins show a marked improvement in adhesion to paper and other substrates. They also have shown reduced neck-in, smoking and polymer build-up at the die.

Neck-in, in particular, has been a troublesome problem in paper coating. It occurs when edges of the hot polymer web "neck" inward, carrying a thickened bead onto the paper. Neck-in results from a combination of resin properties and extrusion conditions. The new resins minimize the polymer's role in causing neck-in.

The resins are recommended for extrusion in the 575°-600°F. range, and cover a wide range of coating weights as shown in the chart at left.

U.S.I. COATING RESINS

| PETROTHENE Resin | 203-2 | 201-2 | 200-2 |
|---|---|---|---|
| Melt Index | 8.0 | 5.0 | 3.0 |
| Density | 0.915 | 0.915 | 0.915 |
| Coating Weight | 3-15 lb. per 3,000 sq. ft. | 10-25 lb. per 3,000 sq. ft. | 20 lb. or greater per 3,000 sq. ft. |

## Polyethylene-Coated Cup Is Tasteless, Odorless

A polyethylene-lined paper cup for hot drinks is reported to be completely tasteless and odorless. The coating eliminates sidewall staining and penetration.

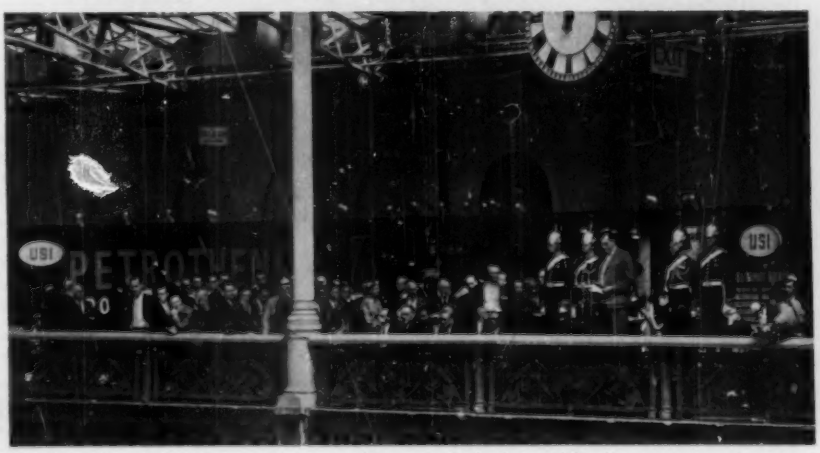
While ordinary plastic-coated paper cups are sprayed with material after they have been formed, the new cup is constructed from paper pre-coated with polyethylene. No glue is used in construction. The polyethylene itself serves as a seal for the seam and bottom, creating a bond that cannot be separated without tearing the fibers of the paper. The coating is said to be bonded firmly enough to the substrate to permit water to be boiled in the cup without damage to the cup lining.

The single wrapped cup nests closer — saving about one-third of the storage space normally required. The cup is available in six and eight ounce sizes, with or without handles.

## New Package For U.S.I. Electrical Grade Resins

U.S.I. electrical grade PETROTHENE polyethylene resins are now being packaged in fifty-pound bags made of 10-mil polyethylene upon request. The bags provide added protection from moisture for the carbon-black compounded electrical resins which tend to pick up water vapor from the air.

## U.S.I. at the International Plastics Exhibition




U.S.I.'s booth at the International Plastics Exhibition was the background for the opening ceremony, June 17th in Grand Hall, Olympia, London, at the Exhibition

exceptional moisture and grease resistance

# POLYETHYLENE-COATED KRAFT OPENS UP NEW OPPORTUNITIES FOR CORRUGATED BOARD

Polyethylene-coated corrugated board — produced on conventional corrugating equipment — is extending the usefulness of corrugated into many new packaging applications.

This unique container board has exceptional moisture and grease resistance and a glossy, non-abrasive liner surface that will not scratch or mar package contents.

Extruders who produce polyethylene-coated kraft liner board can get these extra advantages by using U.S.I. PETROTHENE® polyethylene resins:

**HIGH PRODUCTION RATES**—PETROTHENE resins have good drawdown properties, permit extrusion at high speeds.

**EXCELLENT ADHESION** — with minimum hot melt oxidation.

**NO ODOR** — an important consideration in many packaging applications.

Contact U.S.I. for information on PETROTHENE resins especially suited for coating kraft liner board.

**Packagers are investigating polyethylene-coated corrugated board for applications like these:**

Bulk shipment of meat, where moisture and grease-proof interiors reduce weight loss of the meat and keep moisture from weakening the carton.

Shipment of furniture and other hard goods, where abrasion damage from the container has been a problem.

Bulk bakery and confectionery shipments, where absence of grease-wickage makes containers suitable for reuse as point-of-sale displays.

In concrete construction forms, where the polyethylene coating acts as a release agent.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
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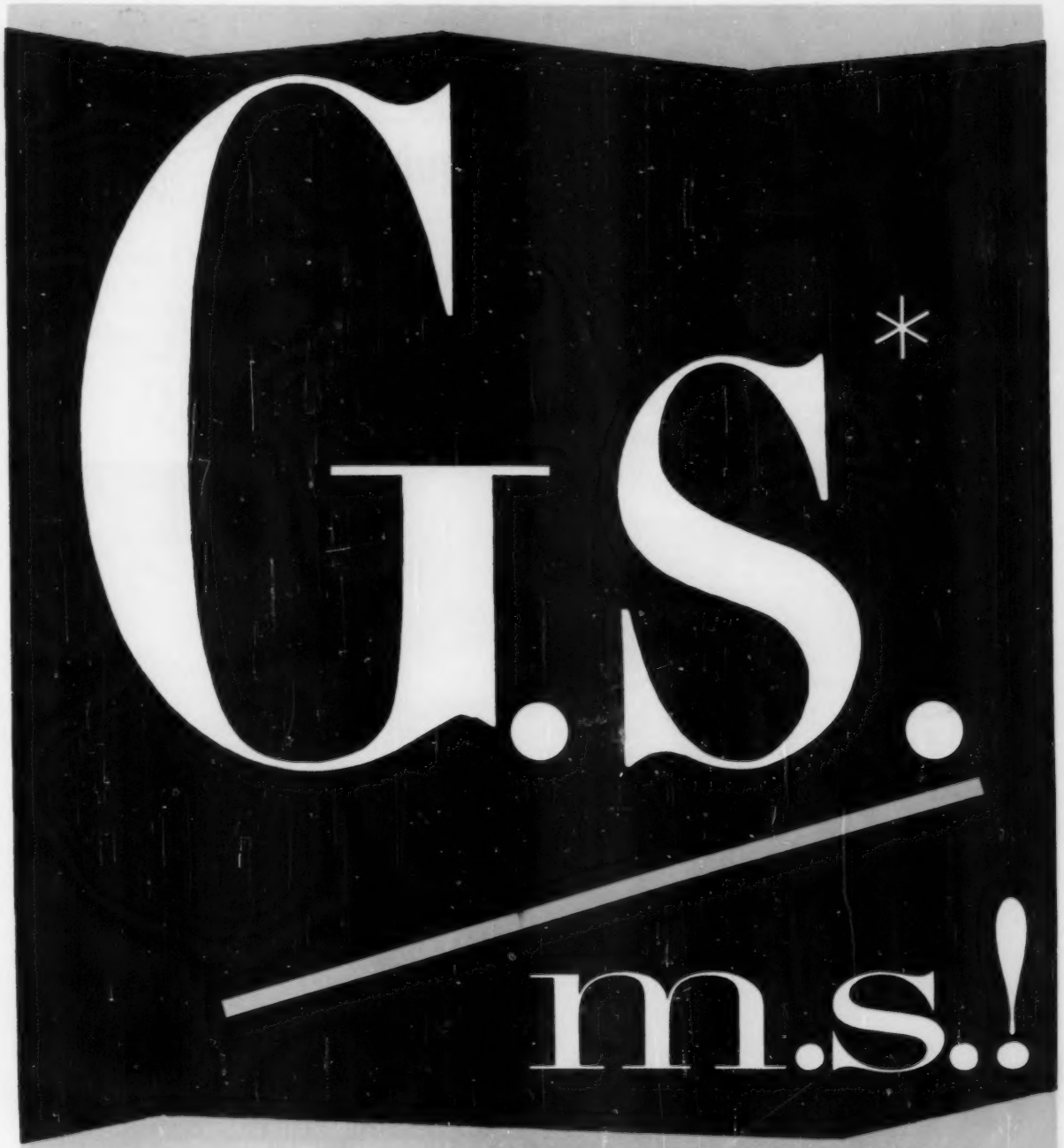
*Branches in principal cities*

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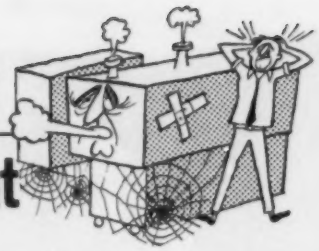
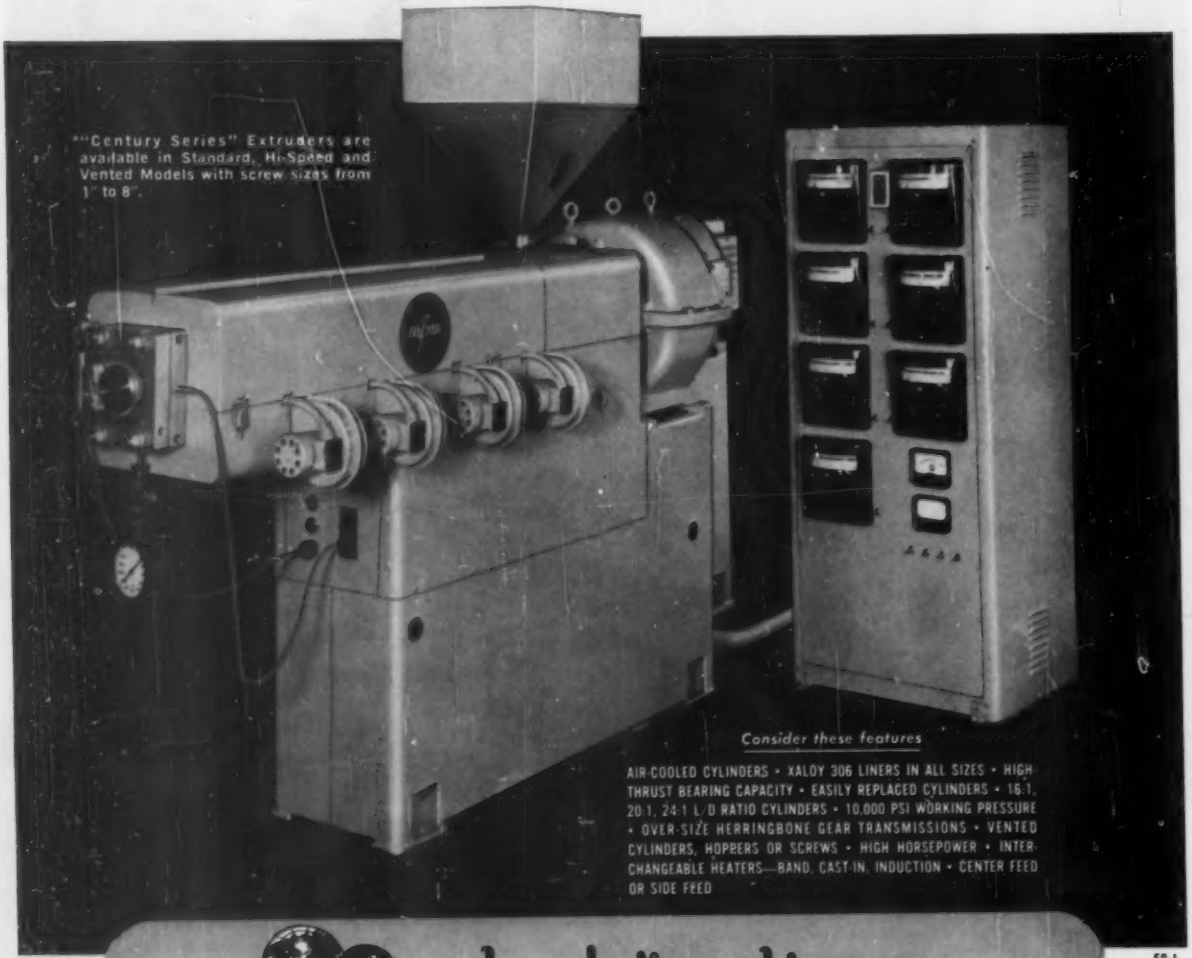
*Antiques are fine...in museums*



# Your plant needs modern* equipment

Antiques can be expensive—particularly in the production line. Figure it out! What does it cost you to operate with obsolete equipment? The costs of down time...the costs of maintenance...the costs of low productivity...the costs of rejects due to poor quality control—can you afford the luxury of obsolete equipment costs?

Profit conscious managements have begun their plant modernization. Let us help you reduce costs and retain your competitive advantage with the advanced "Century Series Extruders." For complete information on these extruders and **a full line of modern accessory equipment,** describe your needs to Mr. Fred Maywald.


*"Century Series" Extruders are available in Standard, Hi-Speed and Vented Models with screw sizes from 1" to 8".
Consider these features
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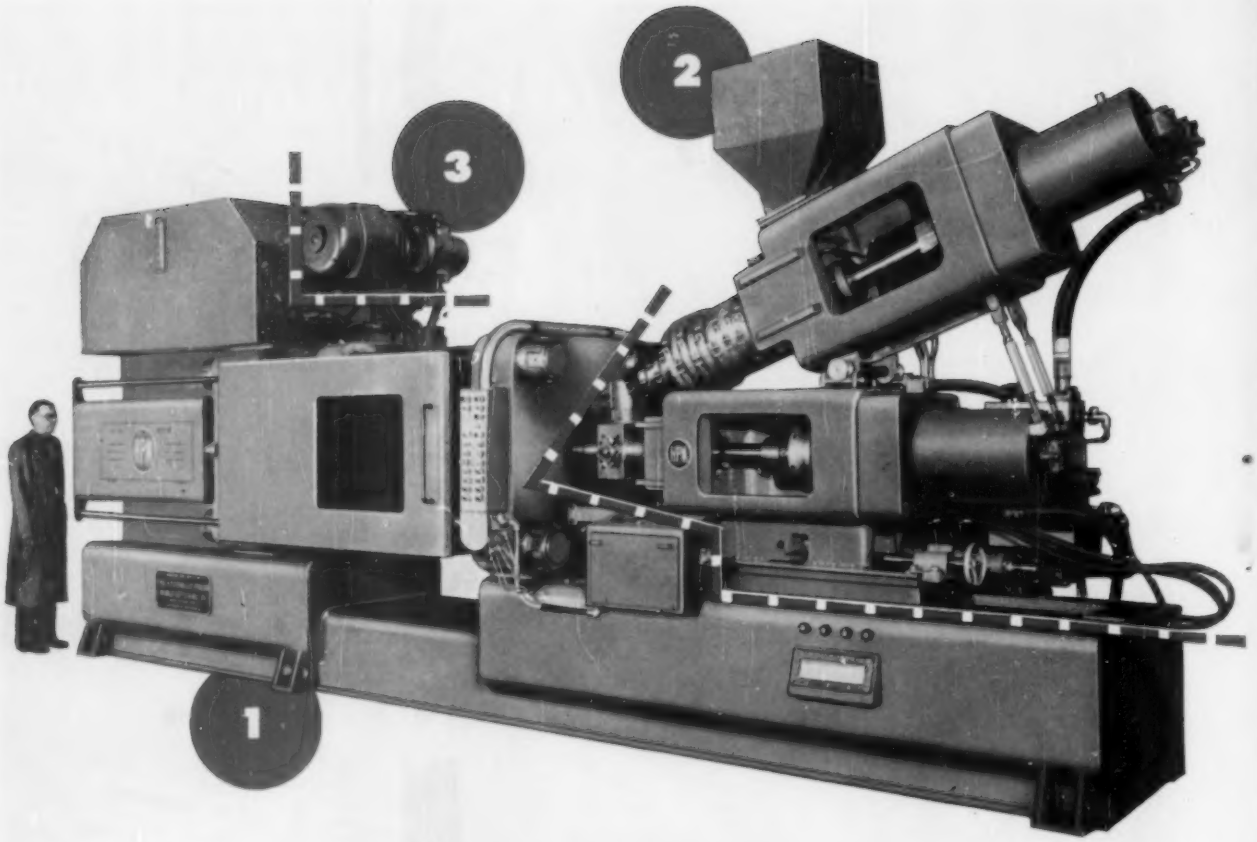



# HOW TO CUT COSTS ON TOUGH MOLDING PROBLEMS

This 80 oz. H-P-M preplasticizer with 650-ton clamp is a typical example of adapting standard H-P-M pre-engineered machine elements for special molding requirements. These special "standards" have saved molders up to $15,000 in machine costs. For example, on the above machine:

**1 — The basic clamp frame is from a standard model 650-HV-32/42 with an alternate injection end. The machine is capable of 80 oz. shots instead of the normal 32/42 oz. capacity.**

**2 — The injection end is "borrowed" from a conventional 450-P-80 preplasticizing machine. Machine provides injection rates of 3300 cu. in. per minute.**

**3 — The unusually high injection rate of 3300 cu. in. per min. is obtained with a 30 HP booster power unit, raising the rate from the conventional 2435 cu. in. per minute. This machine also available with 50 HP booster power units for rates up to 5015 cu. in. per min.**

Other optionals include low pressure mold closing; automatic cycle control with cycle open timer; nylon nozzle kits; automatic lubrication; multiple nozzle arrangements; special heating chambers; special clamp circuits, stroke interruptions and prepositioning to clear knockouts.

***All elements are pre-engineered, providing maximum production potential with only minor engineering charges for special adaptations.***

**CONVENTIONAL INJECTION MOLDING MACHINES COVER WIDE RANGE OF JOBS**

| Model | 200 H 6/8A | 350 HV 12/16 | 450 HV 20/28 | 650 HV 32/42 | 1000-HV-48/64 | 1500 H 80/100 |
|---|---|---|---|---|---|---|
| Material Injected Per Cycle (oz.) | 6-8 | 12-16 | 20-28 | 32-42 | 48-64 | 80-100 |
| Material Injected (Cu. In. Per Min.) | 675 | 1230 | 1450 | 2510 | 3920 | 3320 |
| Plasticizing Capacity (Lbs. Per Hr.) | 90 | 150 | 200 | 300 | 300 | 400 |
| Mold Clamp Capacity (Tons-Max.) | 200 | 350 | 450 | 650 | 1000 | 1500 |
| Platen Size (In.) | 26x26 | 34x34 | 36x42 | 48x48 | 60x60 | 72x72 |
| Clearance Between Tie Rods (In.) | 15½x15½ | 20½x20½ | 21x27 | 30½x30½ | 39½x39½ | 48½x48½ |
| Daylight Opening (Max. In.) Without Ram Spacer | 25 | 34 | 40 | 50 | 65 | 106 |
| With Ram Spacer | 21 | 30 | 34 | 42 | 57 | 94 |
| Daylight Opening (Max.-In.) With Ejector Box Removed | 29 | 42 | 48 | 58 | 79 | 120 |
| Mold Thickness (Min.) w/o Ram Spacer (In.) | 10 | 12 | 15 | 20 | 20 | 46 |
| Mold Space (Min.) With Ram Spacer (In.) | 6 | 8 | 9 | 12 | 12 | 34 |
| Clamp Travel (Max.) | 15 | 22 | 25 | 30 | 45 | 60 |
| Motor Horsepower | 30 | 60 | 75 | 107½ | 180 | 150 |
| Shipping Weight (Lbs.) | 17,000 | 32,500 | 42,700 | 70,000 | 114,000 | 202,500 |

NOTE: All injection capacities specified above are for general purpose polystyrene

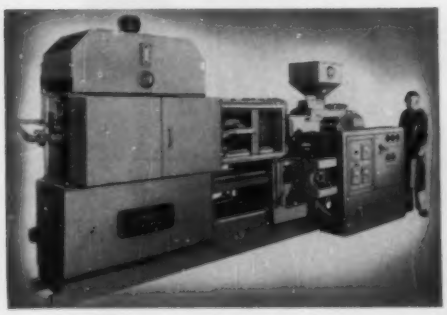
**H-P-M PREPLASTICIZING MACHINES FOR BETTER QUALITY PARTS, FASTEST INJECTION**

| Machine Model | 200-P 28 | 350-P 38 | 450-P 80 | Long Stroke 450-P-80 | 650-P 140 | 1000-P 280 | 1500-P 300 |
|---|---|---|---|---|---|---|---|
| Material Injected Per Cycle (Oz. Max.) | 28 | 28 | 80 | 80 | 140 | 200 | 300 |
| Clamp Tonnage | 200 | 350 | 450 | 450 | 650 | 1000 | 1500 |
| Plasticizing Capacity (Lbs. Per Hr.) | 90 | 150 | 200 | 200 | 300 | 300 | 400 |
| Mold Space (Max. In.) | 15x26 | 20 x 34 | 20½x42 | 20½x42 | 30x48 | 39x60 | 48x72 |
| Daylight (In.) | 25 | 34 | 40 | 54 | 50 | 65 | 106 |
| Mold Thickness (Min. Without Spacer) (In.) | 10 | 12 | 15 | 20 | 20 | 20 | 46 |
| Stroke (In.) | 15 | 22 | 25 | 34 | 30 | 45 | 60 |
| Rate of Injection (Cu. In./Min.) | 1350 | 1210 | 1530 | 1530 | 2510 | 4050 | 6640 |
| Horsepower | 50 | 60 | 75 | 75 | 107½ | 180 | 275 |
| Shipping Weights (Lbs.) | 20,000 | 37,000 | 51,200 | 54,700 | 85,000 | 129,500 | 221,600 |

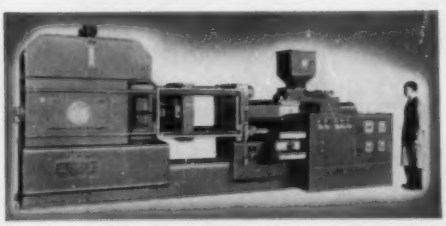
NOTE: Machines can be equipped for higher speed injection if desired.

Special 6 oz. machine with 20 HP booster power unit. 1350 cu. in. per min. injection rate instead of conventional 675. Booster unit may also be used to operate core pulls or unscrewing devices in molds. 25″ or 30″ daylight optional.

Standard 6-oz. machine, ideal for general purpose molding. Available with weigh feeder and all optional features mentioned above. This model also available with P-28 preplasticizer.

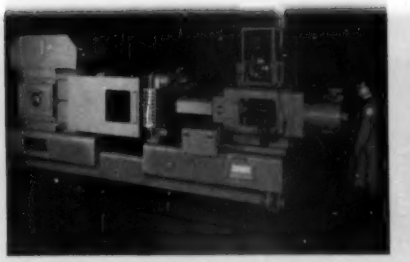


H-P-M model 200-H-6/8A, with long stroke and daylight, is a special machine for deep drawn parts. Available with 42″ daylight and 24″ stroke. All optional features shown are adaptable.

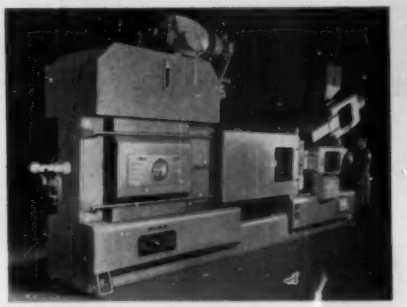


This 12 oz. machine is designed for high speed operation—it's the fastest machine available today. This, too, may be equipped with standard optional features for a variety of adaptations from standard.

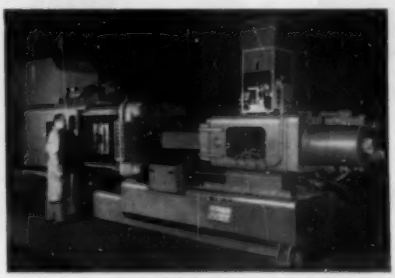
The 12 oz. machine for difficult molding jobs. This special Model 350-HV-12/16 is equipped with a 30 HP booster unit increasing injection rate from 1230 cu. in. to 2110 cu. in. Extra long stroke and daylight are also available.



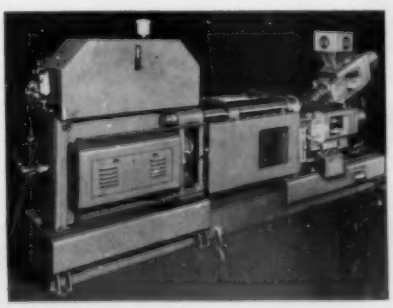
A medium size, general purpose machine especially designed for all-purpose production. Model 450-HV-20/28 has a fast, 75 HP system . . . was the first to offer fast cycling speeds in the medium size machine range. All optionals available for added versatility.



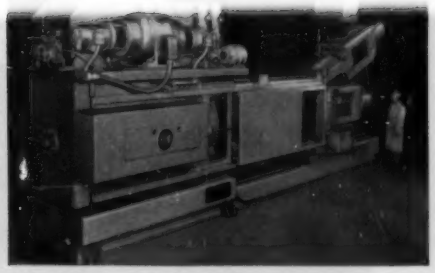
H-P-M 80 oz., a necessary machine for the molder of housewares. Deep drawn parts need exceptionally fast mold filling. Power available for injection rates from 1460 cu. in. per min. to 4040 cu. in. per min. Machine shown has 4040 cu. in. per min.



This 32 oz., a good general purpose machine, is used extensively in the automotive industry. Model 650-HV-32/42 fits the wide gap between intermediate and large machines, has complete optional features including either 30 or 50 HP booster units for injection speeds of 3375 or 3800.

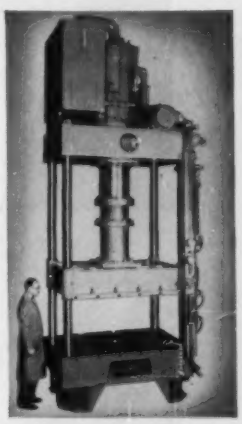


This 80 oz. model is another example of custom designing with standard injection machine elements. Standard clamp and injection end used from two different machines. Large inventory permits delivery of this "special" in four weeks.



H-P-M's 1000-P-200 is a brand new model designed for the molder's ever-changing requirements. Standard model has 79″ daylight, 45″ stroke, 4050 cu. in. injection rate. 50 HP booster unit raises injection to 5300 cu. in.

The 300 oz. has been the leader in this size range since 1957. Daylight 120″; stroke 60″; injection rate 6600 cu. in. per min. A giant machine for exceptionally difficult molding produces huge parts once thought impractical to attempt.



Stock H-P-M presses designed specifically for molding reinforced plastics range in sizes of 100, 150 and 200 ton capacities. Equipped for semi-automatic control, fast closing, automatic slowdown, completely adjustable for speed and pressure.

H-P-M self-contained compression molding presses for thermo-setting plastics. Completely hydraulic, they are arranged to operate semi-automatic molds equipped with knockouts. Stock sizes—100, 200, 300 and 500 tons with larger sizes to 2500 tons available on order.

H-P-M transfer presses permit low cost molding of thermo-setting plastics. Designed to permit incorporation of various types of inserts with no trouble. Stock sizes 100, 200, 300 and 500 tons. Larger presses on order.

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A Division of Koehring Company, Mount Gilead, Ohio, U.S.A.

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H931

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The Airco Technical Representative can be a Very Important Person to you. He has wide experience on Vinyl Acetate Monomer. And is technically trained for the job. Access to a whole library of data. And the ability to add creative thinking to your projects.

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*Represented Internationally by Airco Company International*

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to mold a better lens barrel
**Bell & Howell** specifies

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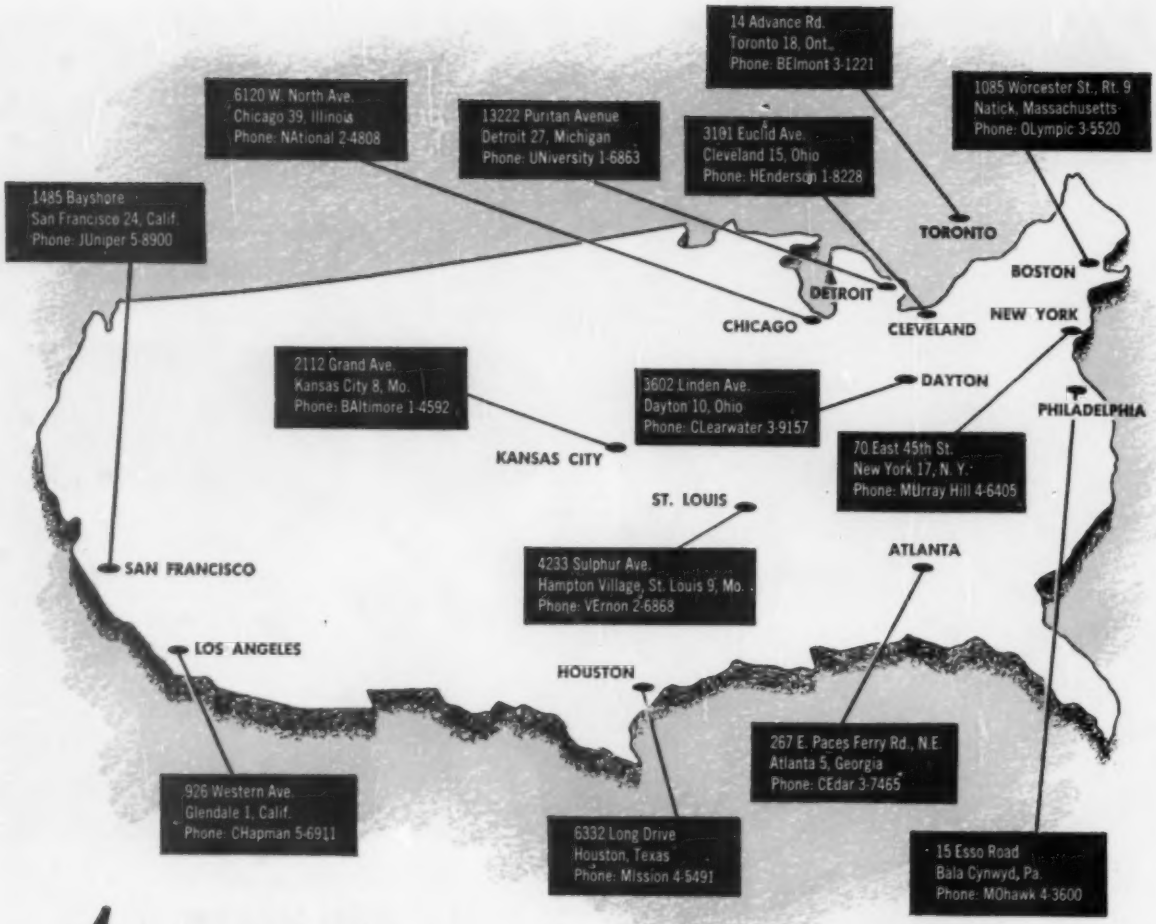
ROLL OUT the barrel. Or roll it in, by rotating in reverse direction. The fine lens, and its threaded barrel molded of phenolics, combine to give you excellent helical focusing of slide-showings with this projector.

It's the Headliner/706 low-silhouette slide projector, a member in good standing of the famous Bell & Howell family of quality photographic equipment. Through use of a 300-watt "short" lamp, occupying far less vertical space than conventional projector lamps, the Headliner is of extremely compact design —only 7 inches high.

Among Plenco's contributions to the production of this dependable performer is the special-purpose phenolic compound specified by Bell & Howell in the molding of the projector's accurate, smooth-turning *lens barrel*. Requirements called for a material that would assure resistance to heat, dimensional stability, and surface hardness and rigidity . . . together with a lasting, eye-appealing lustre. Plenco provided the answer. Like Bell & Howell, many other manufacturers and molders find the answer to their product or production problem in the wide variety of controlled-quality Plenco phenolic compounds. And they find consultation with Plenco technicians a worthwhile preliminary. We invite *you* to take the opportunity to talk with us, soon.

**PLASTICS ENGINEERING COMPANY**
Sheboygan, Wisconsin

Serving the plastics industry in the manufacture of high grade phenolic molding compounds, industrial resins and coating resins.

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*For more information, write for Bulletin SC-59, Address Dept. MP-959, The Sinclair-Collins Valve Company, 454 Morgan Ave., Akron 11, Ohio.*

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DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

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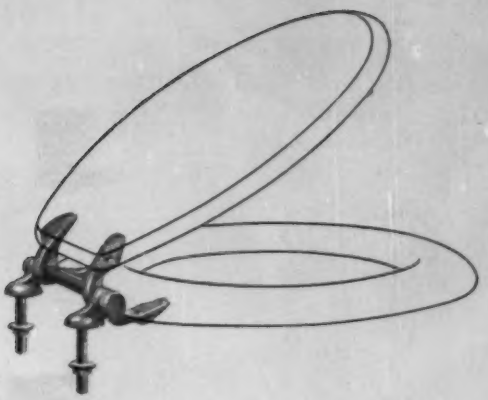
NEW DESIGNS IN MARLEX



# C. F. Church selects MARLEX* for revolutionary new toilet seat hinge

**"We picked MARLEX rigid polyethylene for this component because it combines economy with all of the qualities needed in a hinge of this type . . . toughness, unbreakability, resistance to corrosion and bacteria . . . self-lubrication, rigidity, hard glossy surface and colorability."**

This new MARLEX hinge represents the first major improvement on the conventional brass bar hinge, which has been used by the plumbing industry for almost one hundred years. Like so many manufacturers, the C. F. Church Division of American Standard recognizes that in MARLEX they have a material that can successfully replace metals, glass and wood, as well as more expensive plastics such as nylon, in thousands of component applications.

*No other type of material serves so well and so economically in so many different applications. How can MARLEX serve you?*

*MARLEX is a Trademark for Phillips family of olefin polymers.

**PHILLIPS CHEMICAL COMPANY, Bartlesville, Oklahoma,** A Subsidiary of Phillips Petroleum Company

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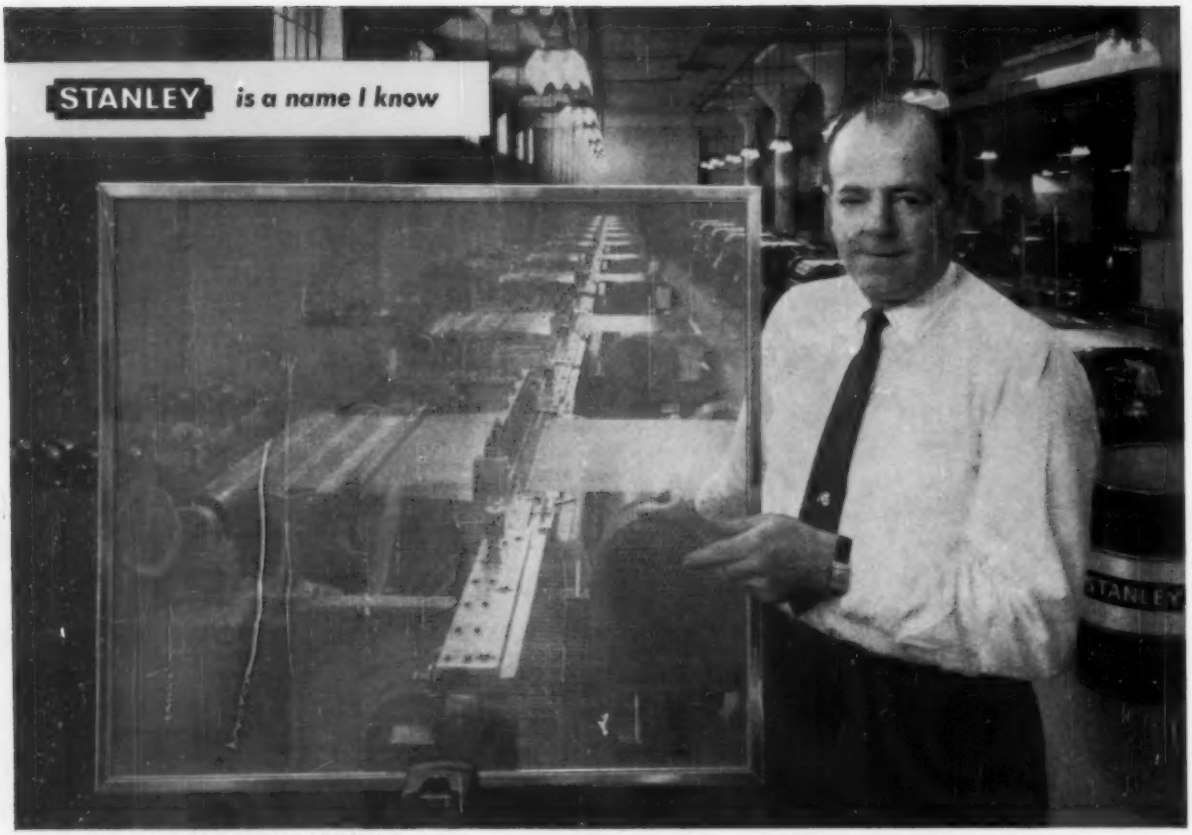
| GEneva 4-7600 | Digby 4-3480 | FRanklin 6-4126 | TErrace 4-6600 | MUrray 1-6997 | EMerson 8-1358 |

**EXPORT:** 80 Broadway, Suite 4300, New York 5, N.Y.

MARLEX® PHILLIPS 66




Stuart M. Jones, Vice President, New York Wire Cloth Company

# "STANLEY VINYL COATING keeps our screening from growing old"

"Our Opal Vinalume insect wire screening is clad with a vinyl coating custom-formulated by Stanley Chemical to satisfy specific needs. We demand high resistance to abrasion, all kinds of weather and the corrosive effect of salt air . . . and attractive colors. Stanley's coating helps make Opal Vinalume 'the window screening that refuses to grow old'!"

Stanley Chemical is a major supplier of standard and *specialized* plastisol and organosol coatings, finishes and molding compounds for the wire and wire products industry. Write for details to The Stanley Chemical Company, Dept. I, 1438 Berlin Street, East Berlin, Conn.

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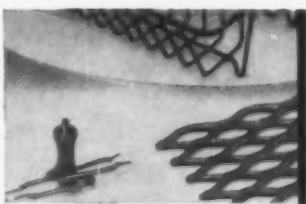
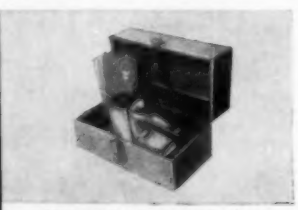
For 116 years, The Stanley Works, New Britain, Conn., has contributed to the growth of America, providing industry, business and the farm and home with products of unsurpassed quality.



**PLASTISOL COATINGS** for more attractive appearance, longer life or faster production cycles; custom formulated to specific needs.

**LAMINATING ADHESIVES** for vinyl-to-metal applications. Will insure maximum bonding strength and security; greater customer acceptance.



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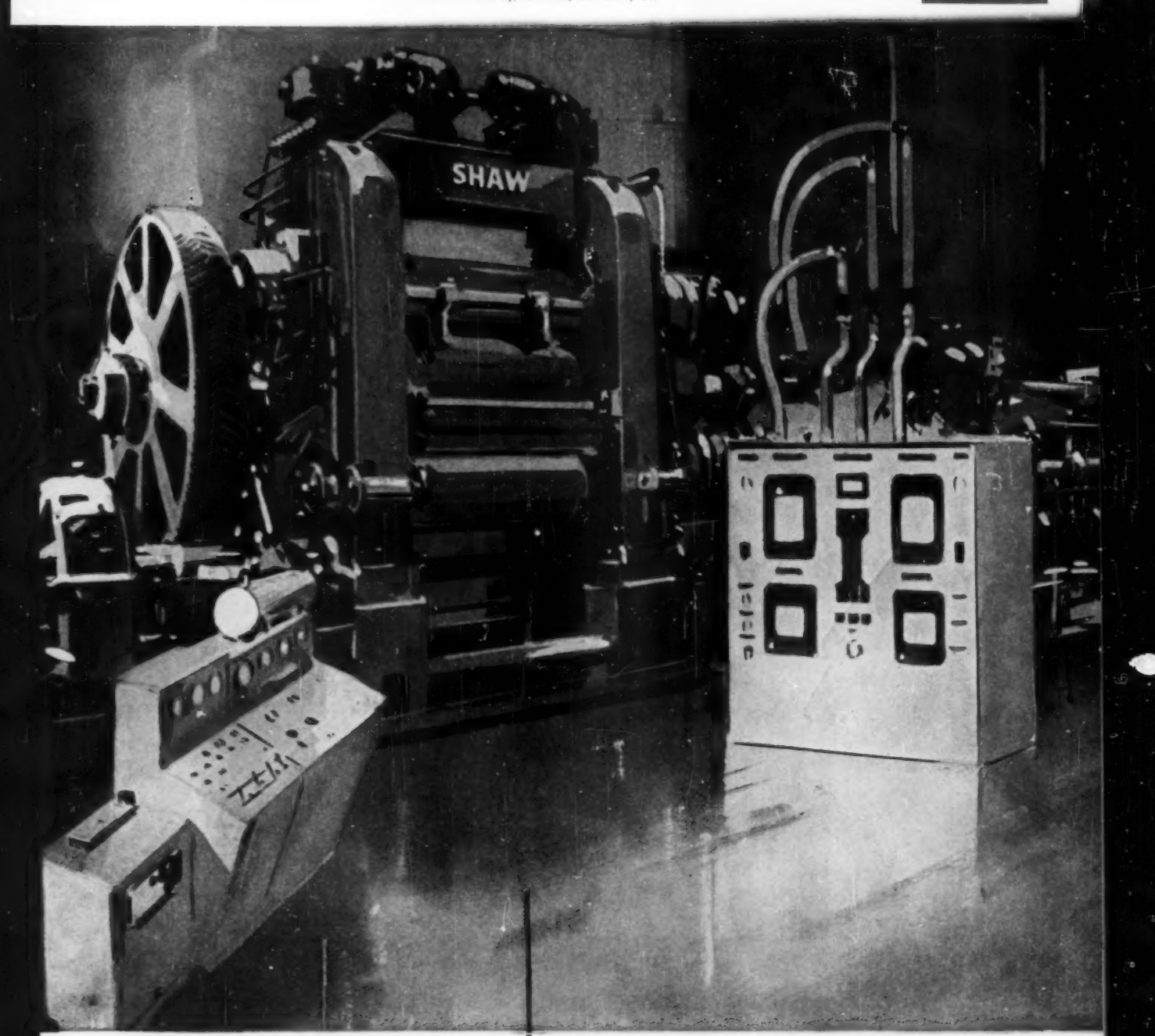


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for solution applications.

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Erie Foundry regularly builds hydraulic molding presses in capacities of 25 to 4,000 tons. Our advanced design control systems will apply forces accurately and precisely, maintain platen temperatures within close tolerances, and perform molding cycles with split-second timing. Versatility is built in so that a wide range of molding jobs can be handled.

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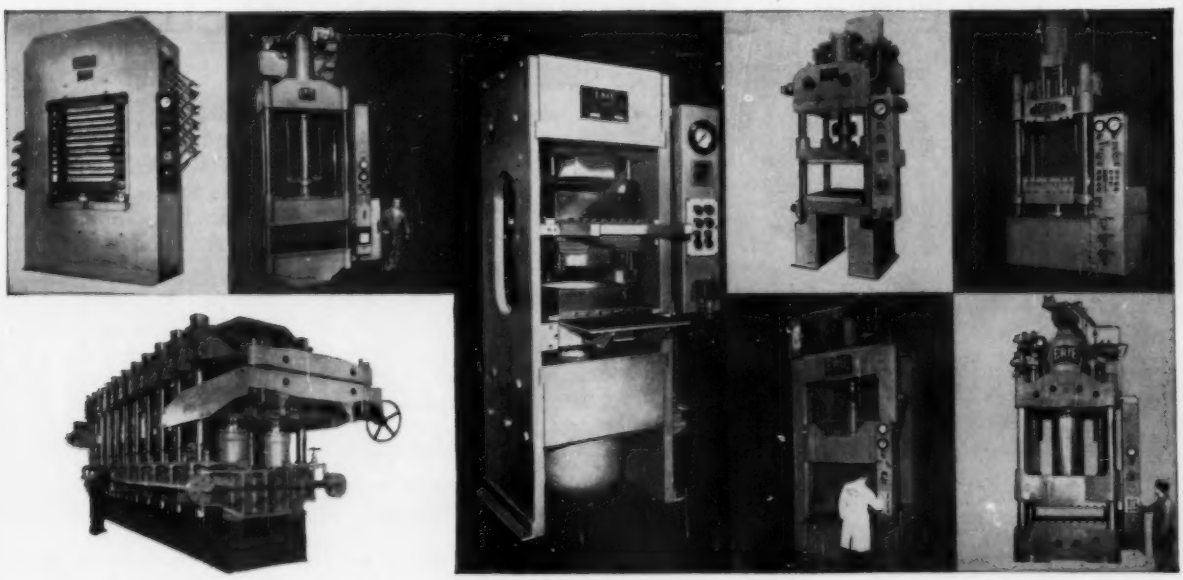

## Your injection-molded product may be "a horse of a different color" but ERIE PLASTICS can produce it

ERIE

PLASTICS
DIVISION

This rugged and realistic molded cayuse for the nursery wrangler, designed and marketed by Wonder Horse Products Co., of Collierville, Tenn., is a sample of ERIE PLASTICS injection molding. Molded in two halves of styrene or Tenite acetate, these toys range in press size from 32-oz. for the Wonder Pony to 48- and 60-oz. for the Wonder Mare and Wonder Horse.

With ERIE PLASTICS handling your custom molding, you can depend on a product of quality appearance, delivered on time in adequate quantities at a price that protects your profit margin. ERIE'S molding technique is backed by more than 23 years of injection molding experience. And a battery of 25 high speed presses, from 8- to 100-oz. capacity, are your guarantee of adequate economical production.

Write today to arrange for an ERIE PLASTICS sales-engineer to call and discuss your custom molding requirements.

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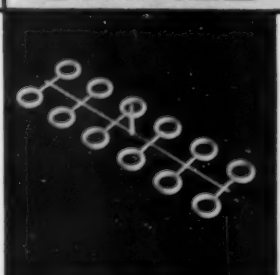
## THICK and THIN

**Pipe Fitting:** Kralastic; 9½ ounce shot; ¼" maximum wall thickness: 4⅞" long x 3⅞" diameter.

**Containers:** High Impact Polystyrene; Hot runner; 3½ ounce shot; .030" wall; 5⅛" deep x 4¾" diameter.

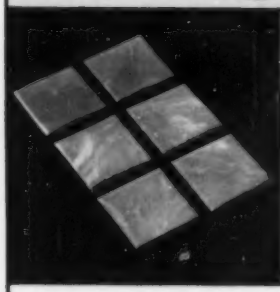
## BIG and SMALL

**Bait Bucket Liner:** High Density Polyethylene; 7½ ounce shot; .060" wall; 6⅛" deep x 10 1/16" diameter.



**Rings:** Standard Natural Nylon; 5 ounce shot; 12 cavities, each 1⅞" diameter; ½" maximum thickness.

## SHALLOW and DEEP



**Wall Tile:** Standard Polystyrene; 3½ ounce shot; .050" wall thickness; each 4¼" x 4¼".

**Juice Pitcher:** Low Density Polyethylene; 5½ ounce shot; .065 minimum wall; 9 11/16" deep (with sprue.)

...it molds them all!

# THE NEW 6/9 OUNCE LESTER

## INJECTION MOLDING MACHINE

*LESTER-PHOENIX, INC.*

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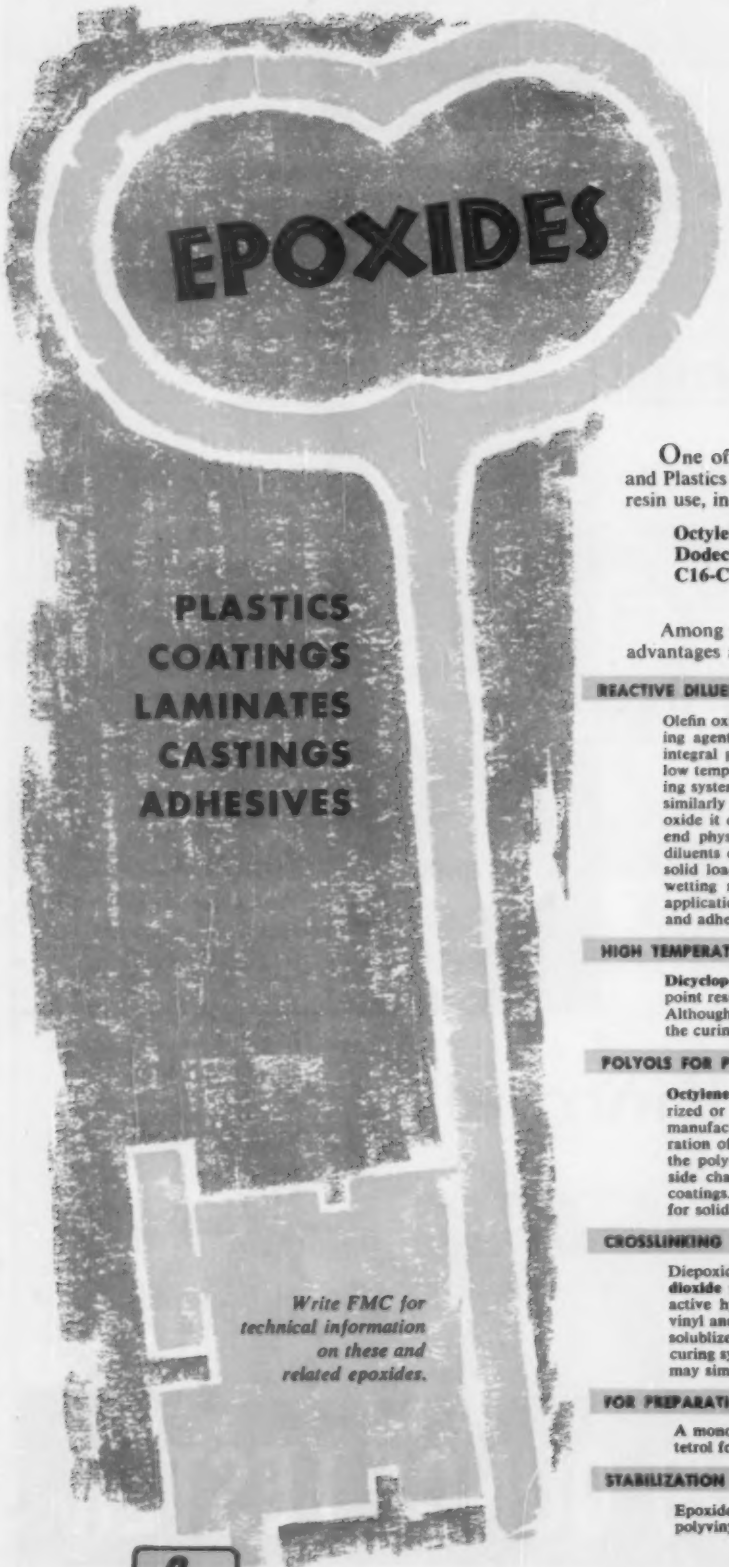
*Agents in principal cities throughout the world*




# ...the key to improved resin formulations

One of the major suppliers of epoxides, FMC Chemicals and Plastics Division offers a broad range of these chemicals for resin use, including:

**Octylene Oxide**
**Dodecene Oxide**
**C16-C18 Olefin Oxide**
**Limonene Monoxide**
**Alpha-Pinene Oxide**
**Limonene Dioxide**
**Dicyclopentadiene Dioxide**

Among the areas where these epoxides contribute significant advantages are:

## REACTIVE DILUENTS AND MODIFIERS FOR EPOXY RESINS

Olefin oxides such as **Octylene oxide** are efficient viscosity reducing agents, entering into the curing reaction and becoming an integral part of the final resin. Auxiliary benefits are improved low temperature flexibility, prolonged pot life for polyamine curing systems, and moderated exotherm. **Limonene dioxide** can be similarly applied as a reactive diluent. As a bifunctional diepoxide it contributes viscosity reduction with minimum effect on end physical properties, such as heat distortion point. These diluents can be used in casting applications particularly at high solid loadings, and in preparation of laminates where efficient wetting necessitates a low viscosity material. They also have application as reactive solvents for 100% active coating systems and adhesives.

## HIGH TEMPERATURE RESINS

**Dicyclopentadiene dioxide** gives extremely high heat distortion point resins on curing with anhydrides in the presence of glycols. Although **Dicyclopentadiene dioxide** is itself a high melting solid the curing formulations are liquid and have good pot life.

## POLYOLS FOR POLYURETHANE RESINS

**Octylene oxide** and related olefin oxides can be homo-polymerized or copolymerized to give unique polyols for polyurethane manufacture. Use of small amounts of **Octylene oxide** for preparation of a propylene oxide polyol breaks up the crystalinity of the polymer and contributes to improved flexibility. The alkyl side chains contribute to improved solublity of polyurethane coatings. The high carbon-hydrogen to oxygen ratio is of interest for solid propellants based upon polyurethanes.

## CROSSLINKING AGENTS

Diepoxides such as **Dicyclopentadiene dioxide** and **Limonene dioxide** find use as crosslinking agents for polymers containing active hydrogen functional groups, e.g. carboxy, amino. Thus, vinyl and acrylic polymers containing carboxy groups may be insolublized and crosslinked after being laid down with a dioxide curing system. Curable liquid resins with active functional groups may similarly be crosslinked as in casting applications.

## FOR PREPARATION OF ALKYDS AND POLYESTERS

A mono-oxide may be considered as a diol and a diepoxide as a tetrol for the preparation of modified alkyds and polyesters.

## STABILIZATION OF CHLORINATED RESINS

Epoxides are excellent stabilizers for chlorinated polymers as polyvinyl chloride, chlorinated rubbers, etc.

*Putting Ideas to Work*

FOOD MACHINERY AND CHEMICAL CORPORATION

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Riegel's Glascel* is a thought-provoking new impregnating paper for plastic laminates. As a reinforcing material it gives better uniformity and *lower cost* than other non-woven glass materials . . . and higher strength than ordinary saturating papers. Glass content is variable from 5% to 90% to give just the right strength for each job. Long rolls, many weights, widths to 65 in.

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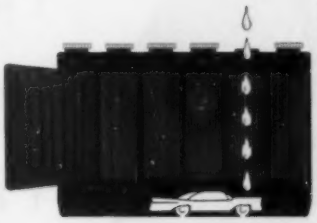
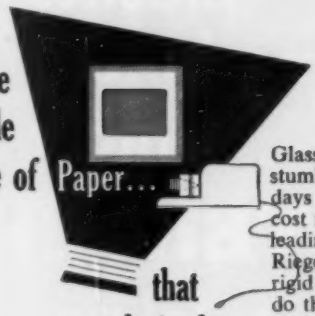


## The little piece of Paper... that popularized color photography



Glass slide mounts were a stumbling block in the early days of color photos. They cost more than the film! A leading manufacturer asked Riegel: "Is there a paper rigid and tough enough to do the job?" That was the birth of the present-day paper mount. Major breakthrough was its special heat-seal coating. Though very thin, it sticks quickly at low heat.

## NO SHRINKING VIOLETS in this printing

Rubber plates for high speed printing are cast in molds made by pressing plastic-impregnated paper against master engravings. Shrinkage and warpage were serious problems. Wood Flong Corporation, leading matrix maker, asked Riegel to search for an answer. Result: A new paper product called "Thermomat®" . . . extremely rigid, coated with special plastic, calendered to precise caliper. Handles fine color printing.

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COMPRESSION MOLDING

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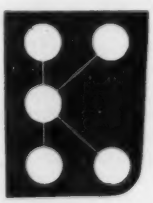

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for screw caps etc.

**Compression and Transfer Molding Machines**
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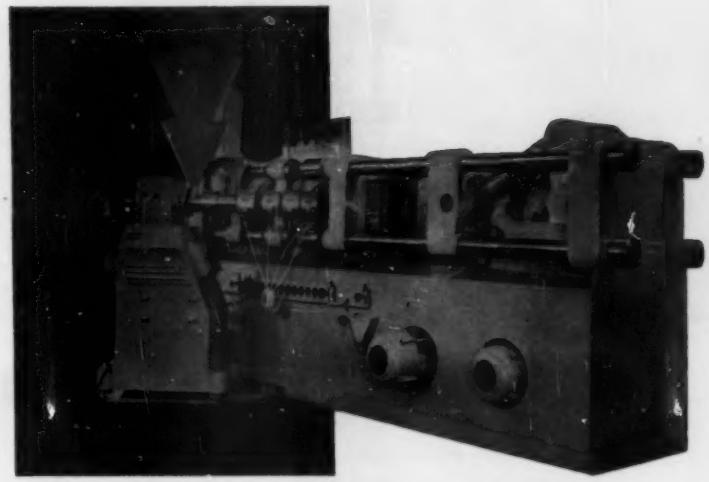
**from 1/10 oz. upwards**

**with**
**SCREW PLASTICIZING UNIT**
**from 1 – 350 OZS**



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Epon 1002 is a new grade of resin that is hard and free-flowing at elevated temperatures. You will find it more economical to buy and use because it saves labor and handling costs. It resists sintering during shipping and storage. Epon resin 1002 may be used as a direct replacement for popular Epon 1001 in amine-cured, clear and pigmented surface coating systems, pre-impregnated glass cloth and other applications.

Epon 1002 is similar in performance to Epon 1001. Coating systems based on either resin give superior impact resistance, flexibility, plus excellent resistance to water, boiling caustic, many acids and most solvents. If force curing is desirable, Epon 1002 coatings are resistant to over-bake.

For greater ease in handling, Epon 1002 is packaged in 50-pound, polyethylene-lined, multiwall paper bags . . . simple to store and use. For complete information, including technical bulletin SC:58-107, write to your nearest Shell Chemical district office.

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# THE PLASTISCOPE*

News and interpretations of the news — By R. L. Van Boskirk

**Section 1** — **September 1959**

**Plastics housewares in increasing volume.** At least 220 million lb. of plastics material at a resin value of over $70 million are now being used for housewares in this country, according to a rough guess made in "Housewares—Showcase for Molded Plastics," p. 212 of this issue. The estimate is considered extremely conservative. The article discusses the changes going on in this industry, including new designs, the invasion by high-density polyethylene and polypropylene, and the comeback made by polystyrene. Housewares molders are extremely alert and sensitive to what's going on in plastics molding—a look at their accomplishments is well worth any plastics molder's while.

**Another polypropylene plant ready.** AviSun Corp. of Marcus Hook, Pa., started operation of its polypropylene plant at Port Reading, N. J., on Aug. 22, and expects to have commercial quantities available from that facility this month. The company also has a pilot plant in operation at Marcus Hook that can handle up to 3000 lb. per day for experimental orders. The Port Reading facilities occupy half of the Koppers low-pressure polyethylene plant which has been leased and is operated by AviSun personnel.

AviSun will offer two grades—a general purpose resin for injection molding and a high-molecular-weight material for extrusion of monofilaments and fibers. The company also expects to have propylene film and film-grade resin available soon. Total capacity for resin production at Port Reading will be around 20 million pounds.

AviSun is the second U. S. company to come into actual production of PP. Hercules has been in production for over a year and Enjay is expected to start in 1960. Montecatini has announced plans to build an 11-million-lb. plant in West Virginia. No other companies have made definite announcements, but one material company is reported to have examined samples from 13 companies who are experimenting with it.

An interesting feature of the AviSun production plan is a reported arrangement with Hercules and Enjay whereby all three companies hope to work out a plan so that when customers buy a resin with a given melt index, it will be the same no matter which company is the supplier. In polyethylene resins, the melt index of various producers' resins is not always comparable—thus a melt index of, say, eight from Company A generally varies a bit from an 8 MI from Company B. Since melt index is a most important factor in determining the temperature at which a resin is processed, this uniform MI plan for PP could be a most happy circumstance for molders and extruders.

**Breaking records for production time.** AviSun performed quite a feat in coming on stream just six or seven months after the company was formed by Sun Oil and Avisco, even though Sun had been doing research on polypropylene for several years. Under any circumstances, it is unusual for a (To page 39)

*Reg. U. S. Pat. Off.

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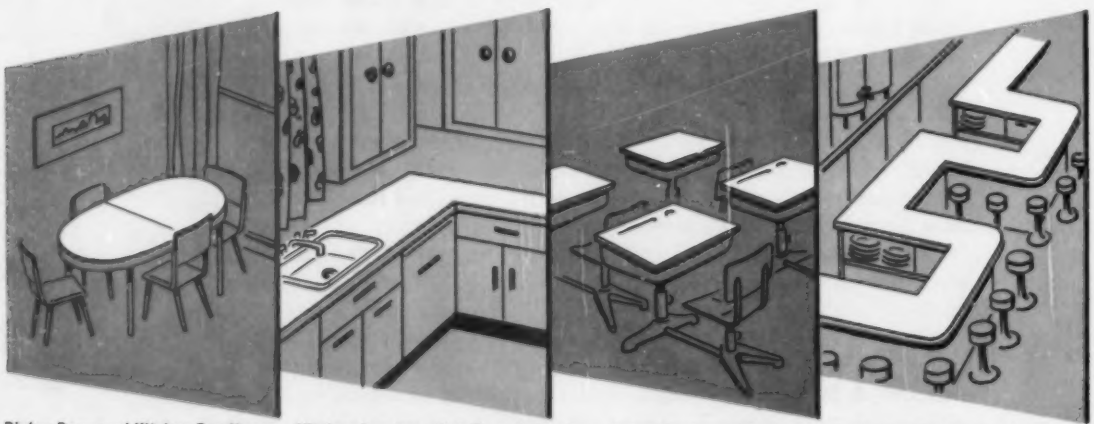

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# THE PLASTISCOPE

(*Continued from page 37*)

company to come into production of a new plastic in commercial quantities in such a short period of time.

One of the reasons for this speed, as explained by AviSun, has been the use of IBM machines which made it possible to obtain advance information on how resins will perform in a mold. Ordinarily, this type of information is obtained by a trial and error method that requires many months.

To further improve rapid development, AviSun is utilizing the services of DeBell & Richardson and Penn Plastics. The former contributes technical service and application development. The latter company will mold and extrude resins to work out any bugs that may develop when the resin is processed in commercial equipment.

**Polystyrene foam markets.** Koppers Co. will merchandise polystyrene foam-core sandwich panels from its new Detroit, Mich., plant as components for houses this fall. The company expects the market for polystyrene foam in sandwich panels to reach 50 to 100 million board ft. in a very few years.

Use as a backlog for aluminum siding is expected to grow from the present 10 to 20 million bd.-ft. to three times that figure in less than five years. The roof market is claimed to have a potential of several hundred million board feet. Use of polystyrene foam board in refrigeration, flotation, and perimeter insulation is now approximately 200 million board ft., according to Koppers, and growing. Ten to 15 million lb. is that company's estimate of expandable polystyrene beads in 1959 for packaging, buoyancy, drinking cups, and insulation, with tripled use in the early '60's.

Koppers has also recently introduced a polystyrene foam product that can be extruded in 5- to 10-mil thicknesses and, when vacuum formed, is claimed to compete with paper in packaging and container applications.

**Extruded netting in plastics.** Among products now being manufactured by Nalle Plastics, Inc., 108-12 W. Second St., Austin, Texas, on the machine pictured on p. 148 of this issue, is a clear vinyl chloride netting in tubular form that has already developed a sizable market as a bag for candy, toys, fruit, and other products, according to George S. Nalle, president of the company. He also states that the netting can be produced in flat, 36-in. wide material for decorative purposes. The machine has also extruded a flat stiff polystyrene net with lattice work effect that can be vacuum formed. When formed, a silicone rubber sheet is used over one side of the netting to form a curtain that will hold the vacuum. A ladies' handbag in a soft, fine netting that may be formed by this method is another promising item. The company has spent over five years in development of this method for producing netting from thermoplastics, and it is well protected by patent applications, according to Mr. Nalle.

**Urethane foam on the march.** The ballyhoo for urethane four or five years ago probably exceeded or at least equaled anything in plastics history except Henry Ford's soybean plastics, polyesters for reinforced plastics, and low-pressure polyethylene. The hubbub may have been premature, but present performance indicates it was well worthwhile. The predicted (To page 41)

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ALSTEELE CHUNK GRINDER CUTTING HEAD

**Alsteele's new** 8 x 20, water-cooled, Heavy-Duty Chunk Grinder handles every kind of thermoplastic: thick slabs, bleeder scrap, heavy cross-sectional chunks, and cylinder purgings. This includes scrap of vinyl, polyethylene, Kralastic, high-impact materials, butyrate and synthetic rubbers.

Alsteele *means all steel*: the Chunk Grinder's cutting chambers are *all steel* . . . the hardened forged rotor is machined from *all steel* . . . and the two large, heavy-duty flywheels are *all steel*.

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# THE PLASTISCOPE

(*Continued from page 39*)

75-million-lb. market for 1959 now seems assured, and 100 million for 1960 looks like a very good possibility.

The use of polyether instead of adipic type polyester resins as the chief component with isocyanate is credited with being largely responsible for this success story. Polyether foam now accounts for more than 60 million lb. of flexible foam, which represents approximately 90% of the market, with polyester in the 4- or 5-million lb. bracket.

The big growth has been in cushioning. More than half the furniture industry is now using urethane cushioning in contrast to less than 25% in 1958. The automotive industry is also interested—has adopted molded topper pads almost exclusively. Inland Motor Div. of General Motors is expected to increase urethane production tenfold this year. Chrysler and Ford are showing increased activity. Mattresses, too, are now a possibility, with Sears Roebuck reportedly planning a promotion campaign in early 1960.

Rigid urethane foam consumption should be from 6 to 10 million lb. in 1959, in contrast to around 4 million in 1958. Growth fields are in refrigerators, sandwich panels, sprayed-on insulation, and boats. Industry expects a 115-million-lb. market by 1964.

**One-shot polyether foam.** Principal reason for growth of polyether urethane foam is thought to be introduction of the one-shot method which eliminates the need for prepolymers and makes possible a less complicated production cycle. About 30% of all slab stock is now produced by the one-shot system, and about 75% is expected to be made by this system by 1960. The key to this technique is the use of new type catalysts, especially Houdry's Dabco, and a variety of metallo-organic catalysts.

Still another improvement is Allied Chemical's just announced method for introducing Genetron, a fluorocarbon propellant, into the formulation. The fluorocarbon makes it possible to mold polyether foam for cushioning with a low density and thus cut costs to the purchaser.

**Expansion in vinyl chloride.** J. P. Frank Chemical Corp., 5410 Avenue U, Brooklyn, N. Y., has announced a 100% expansion of its polymerization facilities. Approximately one-third is now on stream. Original capacity of the plant, built several years ago, has been estimated by the trade at from 9 to 13 million pounds. Included in the resins now available are special-purpose vinyl stearate and vinyl acetate copolymers, including the type used for phonograph records. The company also has a straight PVC, which can be used as a partial replacement for copolymers in records, provided the customer uses a proper stabilizer.

**Nets in the patent office.** There is a feeling in many quarters that extruded thermoplastic netting will eventually cut quite a swath in the plastics industry. What one processor is doing with it is related in another item in this department. Just about the time that Nalle Plastics announcements concerning its netting material and patent applications were made public, Du Pont's Film Dept. stated that Du Pont had acquired U. S. rights to a British process for extruding polyethylene and other polymers in the form of netting. (To page 43)

# VYGEN 110

processability proved right
for revolutionary therapeutic
heat/cooling pad

aquamatic K-pad is a water circulating heat/cooling hospital pad with temperature ranges from 34°F to 105°F. . . . used for body temperature control in low temperature surgery. Specific requirements: low moisture absorption, flexible and soft at low temperatures, easy to clean — sanitary, and non-staining. Designed and manufactured by Gorman-Rupp Industries, Inc., Bellville, Ohio. Sheeting specially compounded and extruded by Conneaut Rubber & Plastics Company, Conneaut, Ohio.

Vygen 110 is not just another quality resin, but one of a family of specialized PVC resins developed and manufactured to meet the requirements of the processor and the demands of the end product. No matter what your processing requirement, you should look to the VYGEN family for PVC resins *just right* for every application.

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# THE PLASTISCOPE

(*Continued from page 41*)

There is little information available here on use of this material in Great Britain. Both Nalle and Du Pont are apparently going ahead with their developments in this country on the assumption that each has prior claims.

**A book on epoxies.** The average 20% annual growth rate for epoxy resin sales is expected to result in an increase from 37.4 million lb. of epoxies sold in 1959 to 90 million in 1963. This is one of the conclusions reached in a recent study made by the Harvard Graduate School of Business Administration.

Estimates in the study indicate that epoxy coating resins accounted for 73% of all epoxies in 1958, but will decline to 54% in 1963 or about 49.8 million lb. of resin, but electrical resins are expected to go from 2.4 million in 1958 to 9.4 in 1963. Resin for roads, flooring, and construction may be 12 million in 1963. The report also forecasts that drum lot prices for liquid epoxies will drop from 65¢/lb. in 1959 to 60¢ in 1963, and solid resins will go from 56¢ to 50¢/lb. during that period (see p. 160 of this issue for book review).

**Studebaker-Packard buys another plastics plant.** Cincinnati Testing and Research Laboratories, Inc. has been acquired by Studebaker-Packard as its second plastics addition since the purchase of Gering Plastics. C.T.L., Inc. started in 1946 as a research and development organization, but is now producing high-heat-resistant resins used in missile nose cones, reinforced plastic structures for rocket motors, and jet engine parts. 1958 sales were $4 million.

**Polyethylene sales defy imagination.** Miracle is a naughty word in the plastics industry—the most overworked expression in the vocabulary—but it's tough to resist its use in connection with polyethylene where resin sales in first six months were almost 540 million lb., compared with around 375 million in same period of 1958 and about 480 million in the last half of 1958. In May the production figure was 105 million lb., which means the industry could then produce at a rate of over 1.2 billion lb. a year. Since low-pressure PE represented less than 8% of this total, it is evident that conventional PE can be produced at over 1 billion lb. with more capacity still coming in.

Low-pressure type sales are growing too—reached a total of about 7 million lb. in June, compared to a little over 4 million in January. Total for the year is expected to be up to 80 million and if several applications now in the works get going it could approach 100 million. In Germany it is said low pressure PE and polypropylene account for one third of polyolefin production.

Film grade conventional PE resin was reported at over 30 million lb. in June by the Tariff Commission, but resin producers don't believe it. It is possible that a considerable amount of extrusion coating resin is being reported in this category as well as a sizable quantity that is being exported. Besides, there is the problem of correct reporting: not all producers may interpret the government's instructions in the same way. Analysts think actual film consumption in the U. S. will be close to 300 million, which is still a considerable increase over the 240-million-lb. figure they concur on for 1958.

**For additional and more detailed news see Section 2, starting on p. 212**

# LETTERS TO MODERN PLASTICS

Where readers may voice their opinions on any phase of the plastics industries. The editors take no responsibility for opinions expressed.

### Plastics in Poland

Just a note from the Poznan Fair to thank you again for sending the copies of the two very helpful encyclopedias. Fortunately, they arrived in time for the Fair and I have had to use them several times every day to describe processes and equipment as well as to locate names and addresses of suppliers and manufacturers. The interest in plastics in Poland is very high, the need is great and the desire is here. With some help the Poles can become important buyers of raw materials and machines. The problems of trade must be solved to give them a means of earning dollars with which to buy our goods.

I have had the opportunity of visiting the Plastics Institute in Warsaw, as well as the largest injection molding shop in Poland. I also gave talks to two groups of NOT, the top Polish Technical Organization. It has been an interesting but tiring experience for me.

*Jerome Formo,*
*Chief of Plastics Engineering*
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

### Mosaic in plastic

I thought you might be interested in the mosaic that I recently completed. It is made from acetate pellets, and I used about 50,000 pellets to cover the 2 by 3 ft. area. The theme is oriental as the title implies —"Poor Butterfly." The many colors and shades of colors, coupled with the rough texture of the mosaic combine to make an exceptionally beautiful plaque.

Although I am basically a sculptor, I have done several mosaics and I feel the plastic pellets have given me the most interesting and gratifying results. The completed work took about 500 hours.

*Bruce Prosser, sculptor*
Saugerties, N. Y.

### Styrene foam, an addendum

We read, with interest, your article on the various comparatively new applications for molded styrene foam. ("For portable refrigerators, molded styrene foam takes over from metal," MPl, May 1959, p. 93).

At one point in the article you stated that the two primary suppliers for expandable polystyrene are Koppers Co., Inc., and Dow Chemical Co. This statement is incorrect. Our client, United Cork Companies of Kearny, N. J., through its Uni-Crest Div., is a factor in this field, and has been for some time. Although Dow Chemical Co. is perhaps the largest single supplier of plastic foam board, it is a comparative newcomer as far as expandable beads for molders' use, with United preceding it by at least a year or two.

These beads are manufactured in their Jamesburg, N. J., plant, which was built about four years ago at a cost of many, many hundreds of thousands of dollars, and is probably the most modern plant in the industry. It has sufficient capacity to provide both its Kearny, N. J., plant (where Uni-Crest boards are molded) and its Wilmington, Del., plant (where Uni-Crest pipe covering is made), as well as more than ample capacity to supply manufacturers and molders with all the beads they want.

Evidently, the confusion stems from the fact that in the early stages United Cork worked closely with BASF Germany on a license arrangement; however, they never supplied United with beads for commercial purposes; instead, it was more a matter of technical help. Although this goes back a number of years, I note in the item on page 158 of the June issue it says, "It is produced by United Cork Companies Kearny, N. J., using polystyrene beads *supplied by BASF*."

*Douglas J. Turner, Pres.*
Douglas Turner, Inc.
Newark, N. J.

### Stabilizer not experimental

I was very surprised by the article on page 178 ("Light-stable polystyrene") of your July issue which treats light stable polystyrenes as in the experimental stages.

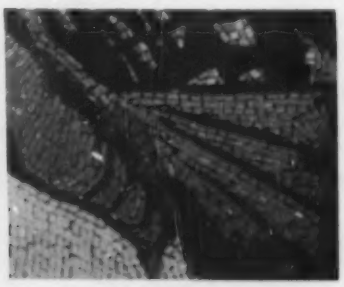
Since early 1956, Monsanto has been manufacturing and selling on a commercial basis Lustrex perma tone styrene. Since that time many millions of pounds have been sold for lighting diffusers without a single complaint traceable to product defect or deficiency.

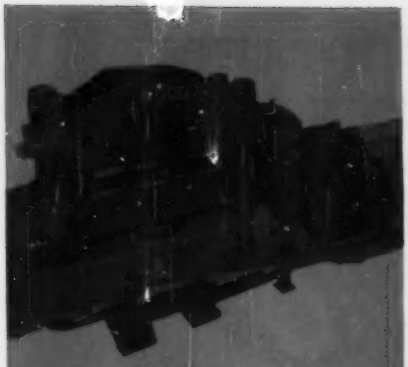
Lustrex perma tone styrene is available in a full range of colors and in crystal, is three times more resistant to yellowing than regular styrene, and is well known to all the major lighting companies. At no time was it ever "withdrawn." In fact, no reformation of Lustrex perma tone has even been necessary and none is contemplated.

We have a Lustrex technical service bulletin on perma tone which completely describes the properties and gives the results of independent laboratory accelerated aging tests which show that Lustrex perma tone exceeds the joint IES-SPI specifications for ultra violet light stabilized styrene. This bulletin was offered in our perma tone advertisement which appeared in the July 1958 issue of MODERN PLASTICS, p. 211.

*Dave Guarnaccia, Sales Mgr.,*
*Styrene Molding Materials*
Monsanto Chemical Co.
Springfield, Mass.

**OVER-ALL VIEW** of mosaic is at left. Area outlined by colored square, which is composed of about 1000 pellets, is shown enlarged below to indicate detail.

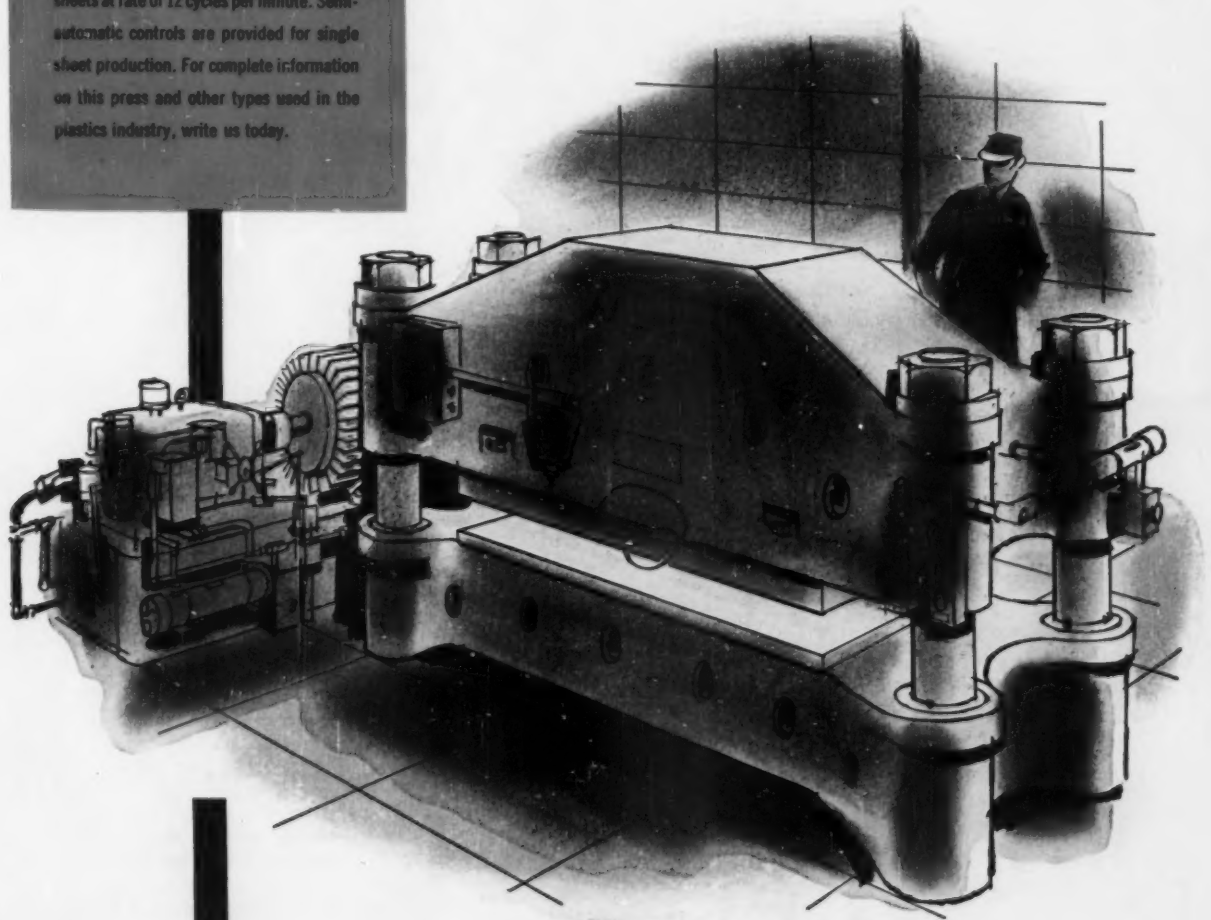




Single Opening 500-ton Embossing Press for use on leather and plastic products. Fully automatic operation with suitable feeding mechanism permits pressing of sheets at rate of 12 cycles per minute. Semi-automatic controls are provided for single sheet production. For complete information on this press and other types used in the plastics industry, write us today.

## *Success is seldom accidental*

People and products do stumble into success. But not often. The success of R. D. Wood Presses, for example, stems from unremitting attention to details. Every R. D. Wood Press is the product of sound design, carefully chosen materials, conscientious workmanship. This is why R. D. Wood Presses consistently deliver the utmost in smooth, dependable performance; fast, economical production; and trouble-free operation. And this is why so many leading press-users specify R. D. Wood.



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# NEW MACHINERY-EQUIPMENT

**Specifications, claims made, and prices appearing in these pages are those of the manufacturers or sellers of the machinery and equipment described, or their agents.***

### Automatic twin-head blow-molding machine

Suitable for use with any commercial extruder, an automatic twin-head blow-molding machine that can form an unlimited variety of containers and other hollow items ranging from 1 to 34 in. long has been introduced by Boston Plastic Machinery, Inc. Designated Diversamatic Model B, the machine will accommodate molds up to 36 in. long and 14 in. wide, with daylight between mold halves up to 21 inches. Any thermoplastic material can be handled, including low- and high-density polyethylene, polypropylene, nylon, and acetate. The machine can also be run manually for fast setups or test runs, and can be operated by unskilled labor.

Production capacity varies with the item to be molded. According to the manufacturer, in a test run using high-density polyethylene, various sizes of round containers were produced at the following rates in units per hour: 2 oz. and 4 oz. size, 1200; half-pint, 720; pint, 660; quart, 540; gallon, 300. Units produced per pound of resin ranged from 113 2-oz. to three 1-gal. containers.

A significant feature is that identical or different molds can be run at the same time. Molds may be of single or of vertically strung, multiple-cavity design. When different molds are used on each head, the manufacturer claims each parison (tube or hot moldable thermoplastic) can be run at a different temperature because the temperatures for each head and the main feed are controlled separately (See Fig. 1.) Both symmetrical or non-symmetrical items can be molded, with continuously uniform parisons assured at all times. Parisons with outside diameter of ½ to 4 in. may be produced. Variations in parison wall thickness are handled by regulating the vertical separator.

FIG. 1

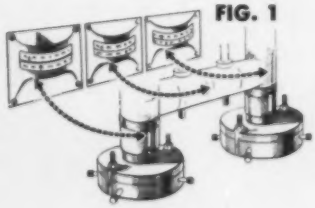


FIG. 2

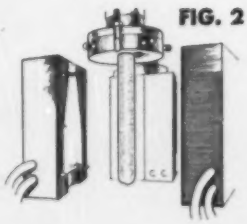
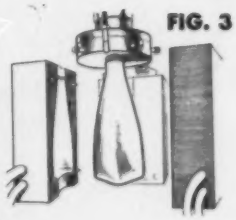
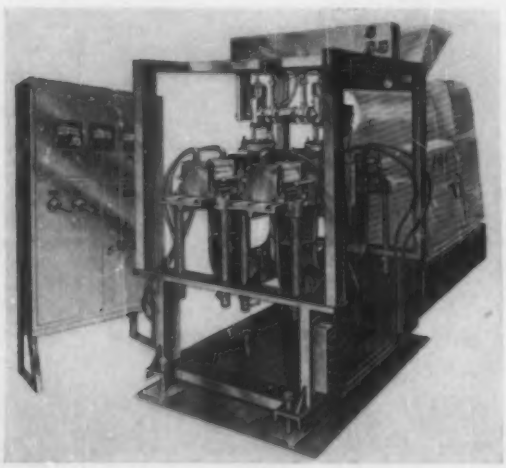


FIG. 3



The unit's operating cycle is illustrated in Figs. 2 and 3. While the left-side mold is open preparatory to receiving the parison, the right-side mold is closed in the blowing and cooling cycle. Timing is synchronized so that as the parison reaches correct size for the left-side mold (which begins to close), the right-side mold opens automatically and the molded item is ejected. The sequence then repeats. Cycles are continuous and automatic. If only one mold is to be used, the extruder stops automatically after each extrusion of the parison, to allow for blowing and cooling.

The new machine's minimum air requirements are 15 cu. ft. per minute, with 110 to 200 lb. main air line pressure. Electrical requirements are: 230 volts, 3-phase, 60 cycles, 4200 watts. The unit's dimensions are 7 by 4 by 6½ ft.; the control cabinet measures 3 by 1 by 6 feet. *Boston Plastic Machinery, Inc., 215 "A" St., Boston 10, Mass.*



**DIVERSAMATIC** twin-head blow-molder, which is manufactured by Boston Plastic Machinery, Inc., is said to be suitable for automatic operation with any extruder.

### Heat distortion tester

Test instrument indicates the deflection of thermoplastics subject to various loads and temperatures in accordance with ASTM D-648 56. The deflection is noted on a dial indicator mounted on the specimen holder. Apparatus consists of bath, heater, agitator, specimen holder, and test bar. Holder and bar are made of invar. *Custom Scientific Instruments, Inc., Kearny, N. J.*

### Automatic spray painter

For painting one, two, or three surfaces of generally oval or rectangular shaped pieces of varying length, where line mask definition and paint demarcation are imperative, model SVF automatic spray painter permits tilting of the overhead traveling guns in one or two directions as well as the painting in both directions when the part is in painting position. This tilting action is said to assure coverage under all mask bridging, and hard to reach corners and edges of the part, **(To page 48)**

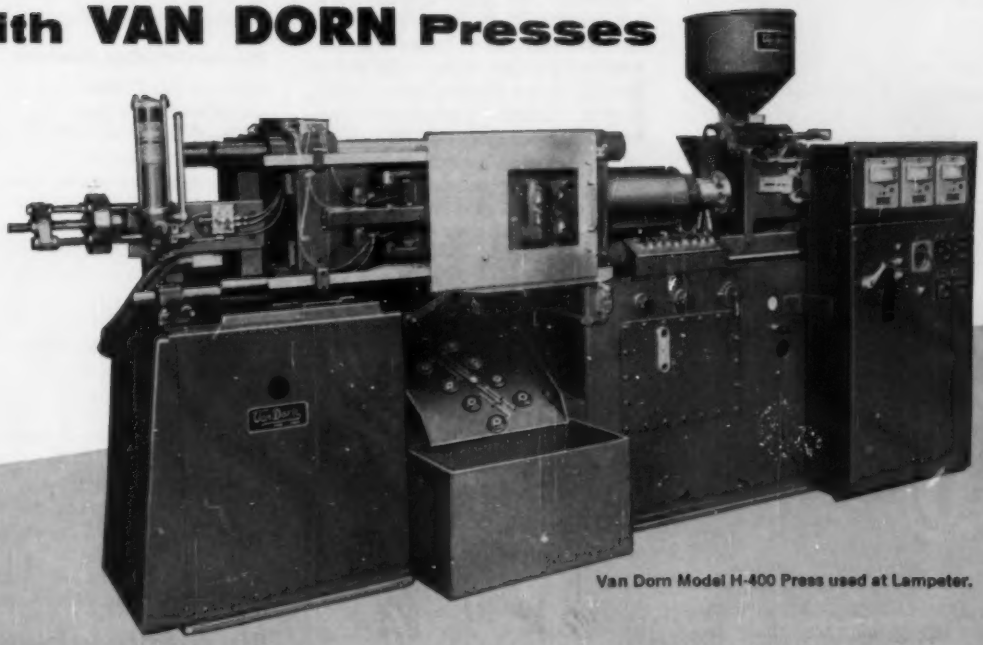
*Prices are deemed to be F.O.B. sellers' plants (unless otherwise stated), are for "standard" models, and are subject to change without notice. The publishers and editors of MODERN PLASTICS do not warrant and do not assume any responsibility whatsoever for the correctness of the same, or otherwise.

Hubley Tic Toy Clock—many of the 40 parts are made on The Lampeter Manufacturing Company's Van Dorns.

tic tock, 'round the clock

# AUTOMATION

# with VAN DORN Presses



Van Dorn Model H-400 Press used at Lampeter.

As a major supplier for The Hubley Manufacturing Company, a leading toy producer, The Lampeter Manufacturing Company is an extensive user of plastic machinery. Lampeter operates their fully automatic Van Dorn 4-6 oz. and Van Dorn 3 oz. presses *24 hours a day, six days per week.*

Besides a substantial reduction of cycle time, the company reports the Van Dorn presses are economical, versatile, and require minimum maintenance. The general manager says that if he buys more machines of the same size, Van Dorns would certainly be a top consideration.

You, too, can save time and money with Van Dorn high production injection presses. Write for detailed information.

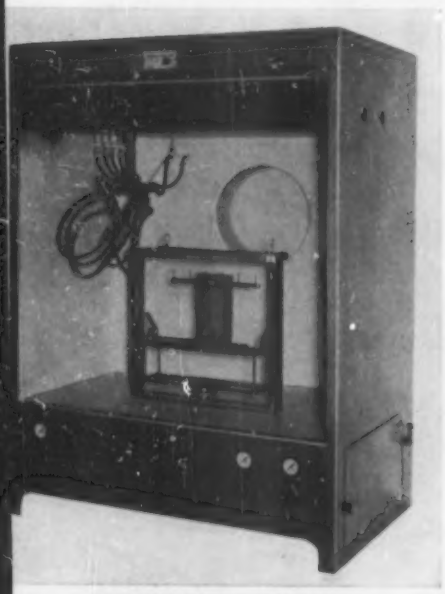
Inspection of toy parts produced on the Van Dorn H-300.

Van Dorn

**THE VAN DORN IRON WORKS CO.**
2685 East 79th Street • Cleveland 4, Ohio

*(From page 46)*

with a reduction in overtravel and a saving of paint. The length and speed of the painting stroke are adjustable within the limits of the size of the model selected. The guns can also be set so as to remain motionless. Standard gun mounting rods



**CONFORMING MATRIX** automatic SVF spray painter features tilting spray guns for better coverage of the part.

may be used. Square shaft vertical fixtures alternately lower and raise the part and place it in the mask. The fixtures are adjustable so as to paint a wide range of different sized parts. Entirely air operated, the SVF is housed in its own booth which can be connected with the customer's existing exhaust system, or fan and motor can be optionally supplied. Air filtering, cylinder and air valve lubrication and water trap ejector are all automatic. The machine illustrated measures 54 by 36 by 75 in. high. *Conforming Matrix Corp., 364 Toledo Factories Bldg., Toledo 2, Ohio.*

### Rotary vacuum dryer

Duplicate controls, which manipulate the bellows and gate valve of the loading-unloading port, are provided on both sides of the Stokes rotary vacuum dryer. This enables the operator to control loading or unloading from the same floor position. The unit can be used for drying heat-sensitive plastic materials at moderate temperatures (about 180°F.) to prevent degradation of polymer quality.

The 50-cu.-ft. chamber rotates in two sets of self-aligning roller bearings sealed off from the interior of the chamber. The bellows is expanded by a pair of air cylinders so that its outer flanges mate tightly with the bottom flange of the charging hopper or with the top flange of the receiving hopper, thus eliminating dusting during loading or unloading. The gate valve is operated by a separate air cylinder.

The Stokes dryer is hot-water jacketed, and parts coming into contact with the material to be dried are made of Type 304 stainless steel. Vacuum is provided by a Model 148, 38 c.f.m., rotary mechanical pump, capable of an ultimate blankoff pressure of 250 microns. The dryer has a fixed-speed drive through a chain-and-sprocket transmission. *F. J. Stokes Corp., 5500 Tabor Rd., Philadelphia 20, Pa.*

### Hardness testers

Model H5 Wallace Dead Load Micro-Hardness Tester is claimed to eliminate the need to mold standard size test specimens; instead, it measures the hardness of small parts, sheets, and irregular shapes directly. The depth of indentation is measured electronically. The basic machine consists of an indentor and a means of applying a minor and then a major load. The instrument is said to give accurate readings on specimens less than ½ mm. thick. This feature is vital where only a very thin layer may be available, such as an oil seal. The unit is also said to measure the hardness or softness of insulating materials on electric wire without stripping the wire or molding a specimen. Two other models are available. Model H6 is for rigid plastics and for measuring the state of cure of synthetic resins and fiber reinforced materials. Model H7 is available for Micro-Hardness measurement of extremely thin surface coatings. *Testing Machines, Inc., 72 Jericho Turnpike, Mineola, N. Y.*

### Thermoforming machine

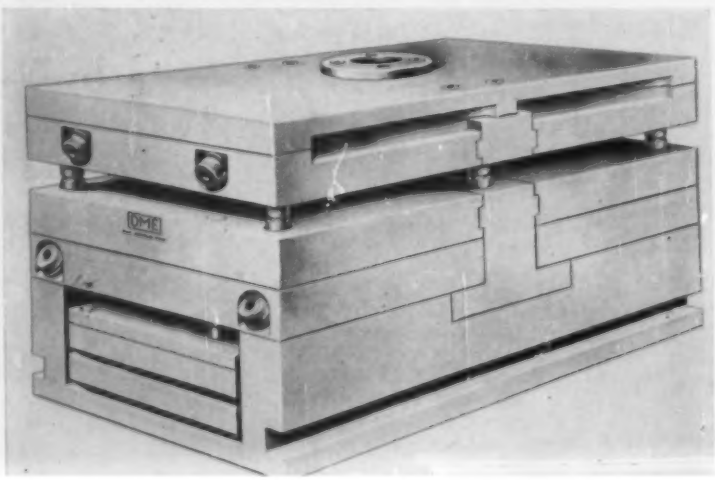
Five standard sizes and 10 models are offered in a new line of forming machines. According to the manufacturer, all models have as standard equipment a master vacuum-air pressure tank which enables the machine to be adapted to vacuum and pressure forming, plug assist, ridge forming, etc. The machines use Chromolux tubular heaters controlled by percentage timers. Air toggles are used for clamping the material hold down frame. Cooling is provided by an electrical blowing system. The stroke of the bottom and overhead ram cylinders is adjustable. Plastic sheet in sizes up to 4 by 6 ft. can be handled on the larger standard models. *Air-O-Flow Industries, Inc., 329 Canal St., New York 13, N. Y.*

### Standardized mold

Standard unit die assemblies are now available for plastic injection molders. The new segmented construction is claimed to enable the molder to replace cavities at minimum cost in a matter of minutes. Three sides of the die assembly are open for installation of either cores or coolant lines.

The twin replacement units are standard 9⅞ by 8 in., using tubular dowel construction to eliminate interference with the **(To page 50)**

**DME** standard unit die assemblies provide for a quick change of cavities. Three sides are open for installation of cores or coolant lines.

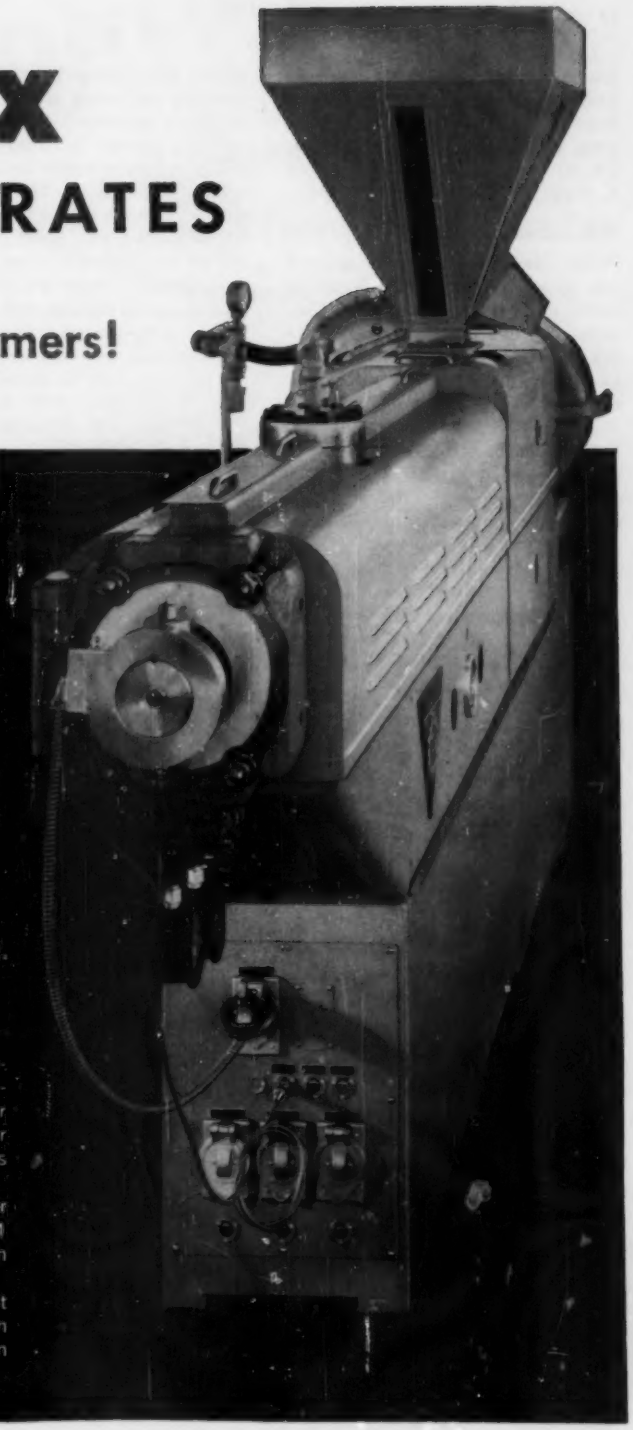


# PRODEX
## PRODUCTION RATES

### ...as reported by customers!

| 1¾" (10 H.P.) | lbs/hr. |
|---|---|
| Vinyl tubing from dryblend | 120 |
| Linear Polyethylene monofilament | 100 |
| Polyethylene blown bottles | 110 |
| 2½" (20 H.P.) | |
| ABS Sheet, vented | 200 |
| Rigid vinyl pipe from dryblend | 170 |
| Polyethylene on cellophane | 170 |
| 3½" (40 H.P.) | |
| Vinyl garden hose | 480 |
| Polyethylene pipe | 380 |
| Roll cast polypropylene film | 370 |
| 4½" (60 H.P.) | |
| High impact polystyrene sheet, vented | 670 |
| Cellulose butyrate sheet, vented | 640 |
| Vinyl coated on wire | 690 |

Proportionately high output rates are obtained on our 6" and 8" extruders



PRODEX EXTRUDERS and EXTRUSION SYSTEMS feature the most advanced developments in extrusion technology. They make profitable operations possible under the most competitive conditions. Higher outputs, faster start-ups, better uniformity, closer tolerances and less maintenance requirements are production proven facts.

PRODEX EXTRUDERS are available either **vented or non-vented with valving**... and with **L/D ratios of 20:1 –24:1 and longer.** All deliver **higher screw speeds** with **higher horsepower efficiency.**

If you're planning the purchase of new equipment, visit our Technical Service Center. Here we'll demonstrate on extruders of various sizes and capacities how production rates such as those shown above are achieved.

WRITE FOR 50 PAGE ILLUSTRATED BULLETIN E-3

## PRODEX CORPORATION

**FORDS, NEW JERSEY** • **Phone HILLCREST 2-2800**

IN CANADA: Barnett J. Danson & Associates, Ltd., 1912 Avenue Road, Toronto 12

PRODEX
—in design and performance
ALWAYS A YEAR AHEAD

(*From page 48*)

placement of water lines. The unit dieholder includes a sprue bushing, locating ring, leader pins, return pins, and a master ejector plate. *Detroit Mold Engineering Co., 6686 E. McNichols Rd., Detroit 12, Mich.*

### Silk screen machine

Fully automatic Series C general silk screen presses are designed to print on sheet plastic and other materials in a wide range of thicknesses, at speeds up to 1800 sheets per hour. Three models accommodate maximum sheets of 36 by 36 in., 36 by 44 in., and 36 by 48 inches. Feeders can be reloaded while press is operating. A special mechanism detects sheets that are stuck together and diverts them without press stoppage. Adjustable precision guides provide for accurate register, and simplified ink control system assures complete uniformity of ink coverage at all times. *General Research & Supply Co., 572 S. Division Ave., Grand Rapids 3, Mich.*

### Small vacuum coater

Coater for short-run and small-lot vacuum metallizing operations consists essentially of a horizontal coating chamber 24 in. diameter by 30 in. long, mounted on a cabinet containing the electrical system, controls, and an external pumping system. Because of the high pumping speed of the 10-in. diffusion pump and the 30-cu. ft./min. rotary gas ballast pump, the manufacturer claims fast cycles. The cabinet is enclosed with safety interlocked door handles and meets standard NEMA electrical specifications. Model 3142 vacuum coater is available with either a motor-driven rotary jig or a hand operated jig. The jig holding device, as well as the bus bars and filament holders, slide completely out of the tank on a draw-pull type arrangement. There are six jig rod frames on the spindle each of which can be independently removed, also, the complete spindle, including the six jig racks, can be loaded and removed as a unit. *NRC Equipment Corporation, 160 Charlemont St., Newton 61, Mass.*

**NRC** Model 3142 production vacuum coater for short runs has controls conveniently grouped on machine.

### Hot stamping head

A 25- to 35-wheel numbering head that also does trademark and name stamping in any desired combination is now available as a standard piece of equipment. More or fewer wheels are provided by substituting engraved wheels for blanks or by reversing this procedure.

Designated as Stamping Head No. 441, the unit is provided with thermoplastic heat control and a thermometer. The cartridge type heater is mounted in the center shaft and plugs into any A.-C. line.

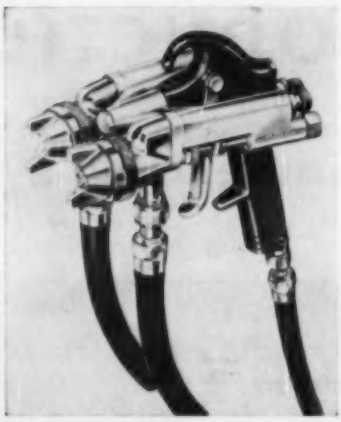
Wheels operate perfectly at all temperatures, according to the manufacturer. A visible index and pointer indicates the exact setting of wheels for the operator. Wheels are released by pressing the levers above them.

An adjustable tape-feed guide provides for the use of roll leaf foil in any hot stamping press having "automatic" roll leaf feed. Where automatic foil feeds are not available they may be provided with the head if desired.

Overall size is approximately 6 in. wide by 8 in. high including shank by 6 in. deep. Delivery with special trademarks requires two to four weeks. *The Acromark Co., 5-15 Morrell St., Elizabeth, N. J.*

### Gun for sprayup

Two-headed spray gun Model 181 is designed primarily for the application of polyester resins where the accelerator mixture must be brought into contact with the catalyst mixture immediately before the mixture hits the work surface. The gun can also be used for spattering or veiling, and for almost any two-component finishing system where perfect mixing is not required, or where premixing is impossible or impractical. Gun body is of drop forged aluminum. Regular gun-heads are drop forged bronze, but stainless steel heads are available. Needle-stroke is controlled at the gun handle, as with standard guns, and spray patterns of each gun may be regulated from round to fan. Three



**BINKS** two-headed spray gun is designed for mixing catalyst and accelerator mixtures in polyester lay-up.

hoses, two for material and one for air, are used with the gun. Normally, two pressure tanks supply equal pressure to each head, but different pressure can be used. *Binks Mfg. Co., 3144 Carroll Ave., Chicago 12, Ill.*

### Multipurpose glossmeter

A multipurpose photoelectric glossmeter has elements of the incident and reflected light beams built onto aluminum blocks mountable at either 75°, 60°, 45°, or 20°.

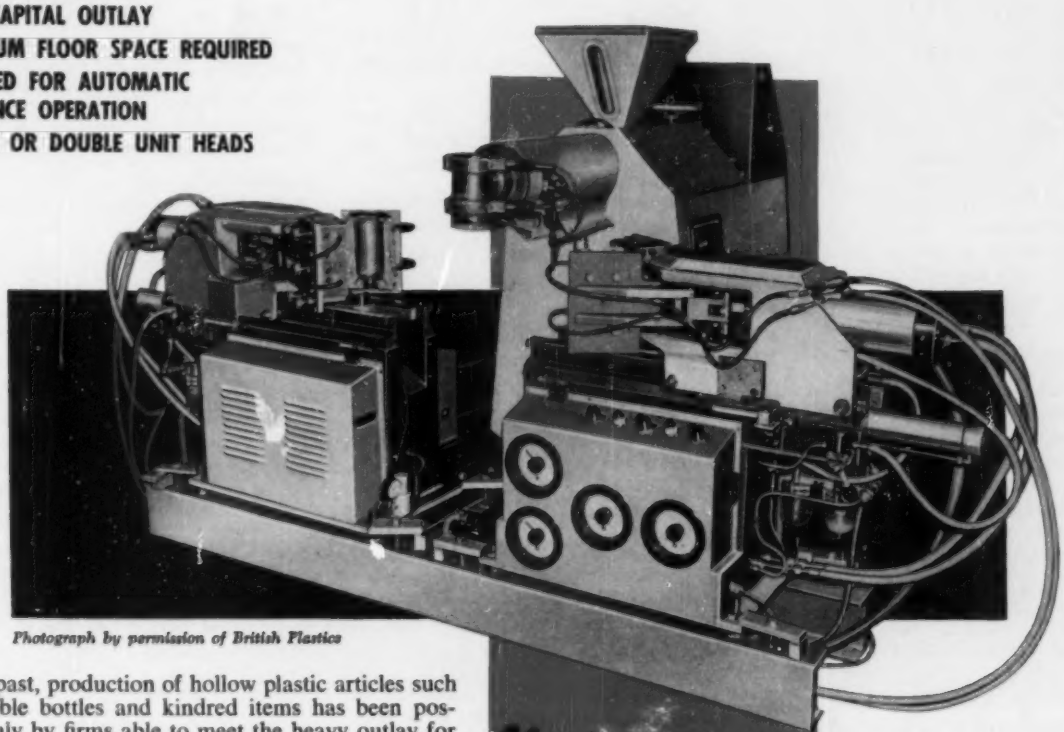
For the plastics, paint, and floor covering industries, the glossmeter will measure gloss by the conventional 60° method of A.S.T.M. D523, and also by the new two-parameter 60° method of A.S.T.M. D1461 for furniture finishes. Measurements by the 20° method of A.S.T.M. D523 are also possible.

The optical and electrical units are separately housed and connected by cable. The glossmeter can thus be used, 1) with the specimen on the front, 2) turned on its back with the specimen mounted horizontally on top, or 3) with the optical unit separate and mounted either flush in a table top for examination of large sheets, or over a moving web for gloss recording. For high precision, a digital dial, operated either manually or by servo-motor, is used in the measurement arm of a null-balance bridge. *Hunter Assocs. Laboratory, Inc., McLean, Va.*—**End**

# BLOW MOULDINGS?

## consider these points

- PRODUCES UP TO 800 BOTTLES AN HOUR
- LOW CAPITAL OUTLAY
- MINIMUM FLOOR SPACE REQUIRED
- COUPLED FOR AUTOMATIC SEQUENCE OPERATION
- SINGLE OR DOUBLE UNIT HEADS



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In the past, production of hollow plastic articles such as flexible bottles and kindred items has been possible only by firms able to meet the heavy outlay for special machinery. After extensive research and experiment, Granbull offer an entirely new and unique method of blow moulding—the GRANDBULL 'AUTO-BLOW' SYSTEM.

The advantages offered by the system are manifold—small capital cost, units are light and compact taking the minimum of floor space and, used in conjunction with a 2" extruder, two units are capable of turning out from 240—40 oz. to 800—2 oz. bottles an hour. The controlled automatic sequence is operated by a simple plug-in connection. Motivated by compressed air, with single or double heads the units ensure complete automatic sequence operation. They are robust and reliable, completely proved in action.

Put the Granbull Extrusion 'Auto-Blow' System to profitable use by sending *now* for an illustrated leaflet.

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# U.S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25¢ each.

### U. S. Pats., May 5, 1959

*Resin-treated leather.* J. W. Cunningham, R. S. Singleton, and G. W. Singleton (to R. A. Singleton). 2,885,300.

*Polymers of cyclotrisilazanes.* S. J. Groszos and J. A. Hall (to American Cyanamid). 2,885,370.

*Carboxylic ion exchange resins.* L. Tauani and M. Morini (to Montecatini). 2,885,371.

*Polyesters modified with dextran.* L. J. Novak (to Commonwealth Engineering). 2,885,373.

*Air-drying resinous ester.* C. J. Campbell (to Hercules). 2,885,375.

*Chlorinated pinene-formaldehyde resin.* F. J. Grasso and W. S. Dow, Jr. (to Harvel). 2,885,376.

*Light-stable halogen-containing resins.* W. S. Knowles and J. Dazzi (to Monsanto). 2,885,377.

*Vinylidene resin plastisol.* J. R. Darby (to Monsanto). 2,885,378.

*Chlorinated polyesters.* V. D. Elardo (to Western Electric). 2,885,380.

*Methylol-aminotriazine allyl ether polymers.* P. Zuppinger and G. Widmer (to Ciba). 2,885,382.

*Vinyltrichlorosilane polymers.* M. C. Brooks (to U. S. Rubber). 2,885,383.

*Polyorganosiloxane resins.* S. Sterman (to Union Carbide). 2,885,384.

*Polyphenylol derivatives of olefinic aldehydes.* A. G. Farnham (to Union Carbide). 2,885,385.

*Amide-like condensates.* R. Sallmann and A. Maeder (to Ciba). 2,885,387-8.

*Ethylene polymerization.* H. M. Schappert (to Koppers). 2,885,389.

### U. S. Pats., May 12, 1959

*Shaping plastic sheet.* R. W. Kazmaier and G. Perry (to L-O-F Glass). 2,885,732.

*Cellular polyethylene sheath.* R. T. Whalen and R. G. D'Ascoli (to Anaconda Wire). 2,885,737.

*Cellular resins.* G. E. Henning (to Western Electric). 2,885,738.

*Polymeric photographic film.* R. J. Rotondo and J. G. Streiffert (to Eastman Kodak). 2,885,936.

*Contact transfer for Xerography.* W. G. van Dorn (to Haloid). 2,886,-464.

*Polyisocyanate adhesive tapes.* P. B. Lavanchy, H. M. Sonnichsen, and J. F. McElroy (to Johnson & Johnson). 2,886,467.

*Polyethylene plastics.* C. R. Bruce and T. N. Williams (to British Cellophane). 2,886,471.

*Bonding Teflon plastic.* S. T. Deakin (to Siemens Edison Swan). 2,886,-480.

*Phosphorus-containing polymers.* L. H. Chance, G. L. Drake, and W. A. Reeves (to U. S.). 2,886,538-9.

*Hydrocarbon resins.* C. J. Kremer (to Atlantic Refining). 2,886,542.

*Polyamide resin.* D. E. Peerman and H. Wittcoff (to General Mills). 2,886,543.

*Alkyd resins.* A. Bayley, C. J. Knuth, and P. D. Thomas (to Pfizer). 2,886,544.

*Thermoplastic with mixed diester plasticizer.* P. H. Rhodes and P. L. Imes (to P. H. Rhodes). 2,886,545.

*Stabilized polymer latex.* C. L. Dilbert and D. A. Taber (to Dow). 2,886,546.

*Composition of polyvinylidene chloride.* D. I. H. Jacobs (to Distillers). 2,886,548.

*Methacrylate polymer compositions.* H. Bartl (to Bayer). 2,886,549.

*Polymerization stabilizer.* D. G. McNulty and R. I. Leininger (to Diamond Alkali). 2,886,551-2.

*Suspension polymerization of vinylidene compounds.* A. Stein and R. L. Walter (to Monsanto). 2,886,553.

*Aluminum-modified phenolic resin* F. Schleuker (to Albert). 2,886,554.

*Polyisocyanate-phenol resins.* W. Bunge, K. H. Mielke and F. Moller (to Bayer). 2,886,555.

*Glyoxal cross-linked acrylamide copolymer.* P. A. Talet (to Nobel). 2,886,557.

*Acrylamide polymers.* H. Z. Friedlander (to American Cyanamid). 2,886,558.

*Polymerization in presence of clay.* R. M. Wiley (to Dow). 2,886,559.

*Ethylene polymerization.* H. Weber, H. B. Speyer, G. Schiller, and K. Stange (to Badische Anilin). 2,886,-560.

*Polymerization process.* W. B. Reynolds and B. H. Asche, Jr. (to Phillips). 2,886,561.

### U. S. Pats., May 19, 1959

*Polyethylene production.* J. D. Calfee and L. E. Erbaugh (to Monsanto). 2,887,445.

*Oil-modified alkyd resins.* R. F. Carmody (to Socony). 2,887,459.

*Polyester-polyamide-manganous salt composition.* J. G. Van Oot (to Du Pont). 2,887,462.

*Copolymers of acrylics and styrenes.* H. W. Coover, Jr. and W. C. Wooten, Jr. (to Eastman Kodak). 2,887,464.

*Stabilizers for chlorine-containing polymers.* H. Hopff (to Geigy). 2,887,465.

*Polyethylene compositions.* G. R. Lappin and G. C. Newland (to Eastman). 2,887,466.

*Ethylene glycol-methylsilsesquioxane.* K. W. Krantz (to General Electric). 2,887,467.

*Copolyesters of a glycol, a dicarboxylic acid and a hydroxy acid.* J. R. Caldwell and J. W. Wellman (to Eastman Kodak). 2,887,468.

*Cellulose-isocyanate compositions.* C. C. Unruh and D. A. Smith (to Eastman). 2,887,469.

*Polymerization of olefins.* N. H. Shearer, Jr. and H. W. Coover, Jr. (to Eastman). 2,887,471.

*Polyethylene.* P. Fotis, Jr. (to Standard Oil). 2,887,472.

*Polymerization of ethylene.* J. H. Balthis, Jr. (to Du Pont). 2,887,473.

### U. S. Pats., May 26, 1959

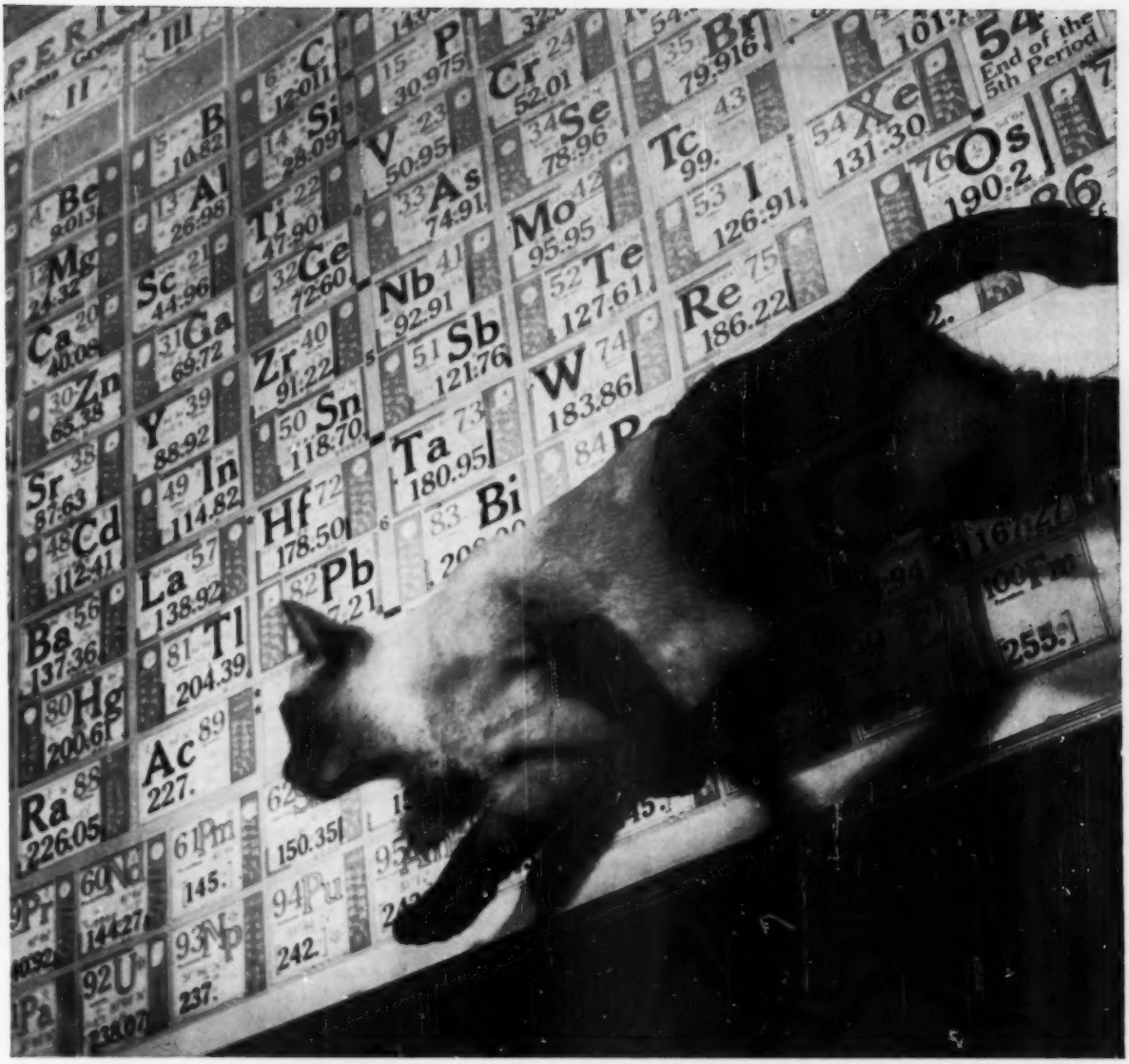
*Cellular polyurethane.* T. H. Rogers, Jr. and N. R. Bender (to Goodyear). 2,888,411-13.

*Vinylidene chloride composition.* A. L. Jankens (to Dow). 2,888,415.

*Polyethylene containing organopolysiloxane resin.* M. M. Safford (to General Electric). 2,888,419.

*Chloro-substituted polyethylene.* R. B. Spacht and C. E. Sturm (to Goodyear). 2,888,423.

*Curable polyethylene composition.* Precopio and Gilbert (to General Electric). 2,888,424. **(To page 170)**




Periodic Chart of the Atoms, Copyright W. M. Welch Mfg. Company, Chicago*

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# WORLD-WIDE PLASTICS DIGEST

Abstracts from the world's literature relative to plastics. For complete articles, send requests direct to publishers. List of addresses is at end of this section.

## General

*Seek polymers stable at 1000°F.* Chem. Eng. News 37, 40 (June 15, 1959). The results of research to develop polymers that are stable at 1000°F. are reviewed. Compounds containing silicon, boron, and phosphorus are being investigated.

*Polyox goes to market.* R. L. Bateman and A. H. Tenney. Chem. Eng. News 37, 66-71, 103 (June 22, 19[illegible]. A new resin, poly(ethylene ox[illegible], is reported. Emphasis is placed on marketing aspects.

## Materials

*Pitfalls in evaluation of PVC stabilizers.* C. H. Fuchsman. SPE J. 15, 214-15, 219 (Mar. 1959). The widespread problem of changing and refining test methods to meet new situations, such as changes in resins, appearance of new stabilizers, and methods of manufacture require careful analysis during the evaluation of stabilizers. Various factors may lead to erroneous conclusions. These include changes in resin, the use of fillers, the use of "typical" formulation, testing sequences, unknown standards and the need of long-term stabilization. Other factors often overlooked in the selection of stabilizers are the use of multiple and single packaging systems, the performance of the stabilizer versus handling convenience, and the effects of lubricants.

*Organic pigments for colouring plastics materials and rubber.* R. Konig. Plastics Progress in India 1, 17, 19 (Feb. 1959). Organic pigments for coloring plastics are described. Formulations and the results of permanance tests are given.

*A new type of secondary plasticizer for polyvinyl chloride.* E. W. J. Beaven and D. Liff. Brit. Plastics 32, 197-98 (May 1959). A new secondary plasticizer based on polyalkylated benzene was evaluated. Various compositions of polyvinyl chloride containing a primary phthalate-type plasticizer and one of three types of secondary plasticizers were investigated for stability to heat and to ultraviolet light. General physical and electrical properties were also measured on these compositions. The polyalkylated benzene composition yielded properties similar to those of compositions containing plasticizers based on chlorinated hydrocarbons and on aromatic petroleum extracts, except that improved thermal and light stability were obtained during the investigation.

*Liquid urethane elastomers.* R. J. Athey. Rubber Age 85, 77-81 (Apr. 1959). Urethane polymers, which can be processed in the liquid phase, may produce materials with properties similar to those of solid urethane polymers. Due to the relatively low molecular weight of the liquid polymers it is necessary to increase the chain length as well as cross-link the molecules during cure. The most desirable properties for general use are attained by curing with aromatic diamines. Glycols may be used as curing agents but produce softer products with lowered strength and toughness. Chlorinated aromatic diamines are convenient curing agents and provide the best balance between pot-life and cure-time. Glycols generally consist of a mixture of a bifunctional chain-lengthening material and a trifunctional cross-linking agent.

*What's new in materials.* Materials in Design Eng. 49, 129-88 (Apr. 1959). A new hydrocarbon thermosetting resin for reinforced plastics has low density, exceptional resistance to water, good chemical resistance, and excellent electrical properties. It is a copolymer of butadiene and styrene. Fluorocarbon plastics parts can be made bondable and dyeable by using a new radiation grafting technique. A new heat-resistant, transparent acrylic-type thermoplastic resin has been developed. It is similar in mechanical and optical properties to polymethyl methacrylate, but has a heat distortion point about 50° F. higher.

## Molding and fabricating

*Vacuum forming of high density polythene.* D. Burgess. Brit. Plastics 32, 195-96, 223 (May 1959). Excellent results have been obtained in the vacuum forming of high density polyethylene (PE). However, the inherent physical properties of this material require certain changes in the equipment and techniques normally used for vacuum forming. High heater input intensities on the order of 3 to 4 kw./ft.$^2$ are recommended for economical heating cycles and to prevent sagging. Forming temperatures are critical due to the rather sharp melting point of high density PE. High vacuum must be maintained throughout the forming and cooling cycle. Auxiliary cooling aids are also recommended. Molds should be temperature controlled, and preferably made of pressure cast metals with a uniform matte finish.

*Heat-sealing and high frequency welding of plastics.* H. P. Zade. Plastics (London) 24, 109-11, 116 (Mar.); 136, 158 (Apr.); 192-3 (May 1959). Several types of heat-sealing equipment are described in detail. The advantages of the various sealers are discussed. Among the equipment described are hand tools, jaw sealers, impulse sealers, molten-bead, hot-filament and radiant sealers, as well as continuous heat-sealing machines and bag-making machines that operate fully automatically.

*Automatic film feeding.* D. R. Forry. Modern Packaging 32, 206-8 (Apr. 1959). A simplified method was developed for feeding thin, soft plastics film through automatic packaging equipment at high web speeds. The new mechanism allows accurate placement of film, eliminating wrinkling and preventing excessive losses during trimming operations. The mechanism involved is described and illustrated.

*Single-impression molds for screw caps with antechamber and internal gates.* H. Gastrow. Kunststoffe 49, 247-48 (May 1959). The single-impression mold for small automatic injection molding machines and small quantities makes the automatic unscrewing of the moldings possible despite the antechamber and internal gates, without having to use special drive motors. It is thus possible for the tool to operate safely and without risk of breakdown.

*Rheological construction of simple extrusion dies.* G. Schenkel. Kunststoffe 49, 201-07 (Apr.); 252-56 (May 1959). In the construction and operation of extruder dies, two requirements have to be met which are closely connected. These are the problem of diversion and (To page 56)

● We see no reason to keep under this reinforced plastic hat the fact that Reichhold sells a QUALITY LINE OF POLYESTER RESINS for every type of product and manufacturing procedure. For full information on RCI's versatile polyesters, clip and mail the check list below. Technical information will be sent to you promptly.

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**REICHHOLD**

REICHHOLD CHEMICALS, INC., RCI BUILDING, WHITE PLAINS, N.Y.

(From page 54)

that of undesirable marks caused by the mandrel support. Some new ways of solving operational problems are discussed, explained with the aid of diagrams, and illustrated by actual practical examples.

### Applications

*Trends in plastics applications in corrosion engineering.* R. B. Seymour. Plastics Progress in India *1*, 6-7, 9 (Feb. 1959). Recent developments in and present status of the use of plastics where corrosion resistance is of prime importance are described. This includes linings, cements, structures, pipe, joints, wraps, and similar applications.

*Nose cones: The case for ablation.* H. G. Lew, S. M. Scala, and G. W. Sutton. Missiles and Rockets *5*, 19-22 (June 8, 1959). Various materials are discussed in relation to their ablative properties. These include plastics, reinforced plastics, oxides, and carbon. Theories to explain the performance of each are presented.

*Plastics invade tower equipment.* Chem. Eng. News *37*, 58 (June 1, 1959). A thermosetting plastic is used to make bubble caps, risers, and other parts for petroleum distillation and treating towers.

*Polymers shine in floor-polish picture.* Chem. Week *84*, 117-18, 121 (June 13, 1959). Styrene, acrylic, natural, and phenolic resins and copolymers of these are used in formulating the new floor polishes.

*Materials for long range missiles and space vehicles.* W. A. Mrazek. SPE J. *15*, 211-13 (Mar. 1959). The rapid advances in missile designs have established requirements beyond the properties of existing commercially available materials. Some of the problem areas such as reliability, strength-to-weight ratios, propellant handling, and temperature problems are discussed in detail. Many problems are solved by the use of plastics but many other areas still require materials with properties superior to those of currently available products. The real advances in overcoming these problems are expected to come from the field of plastics research and technology.

*Use of low density polythene tube in United Kingdom water supply.* D. A. Gill. Brit. Plastics *32*, 182-85 (May 1959). A summary of information on the use of polyethylene pipe in potable water supply systems is presented. The results were obtained through circulation of questionnaires to all water utility authorities in the United Kingdom. The results correlate data on type and number of pipe failures; quantities and types of pipe used and location and type of installation are listed. The data received covers an estimated eleven million feet, or approximately 65% of the estimated amount of pipe that is currently in use.

### Properties

*Effect of small plasticizer concentrations on PVC.* O. Fuchs and H. H. Frey. Kunststoffe *49*, 213-16 (May 1959). The embrittlement effects that become apparent in PVC and vinyl chloride copolymers when small amounts of plasticizer are added to them is explained by the assumption that at low concentrations the plasticizer molecules cause a certain stretching of the macromolecules through solvation. This solution causes the macromolecules to become less mobile and thereby to become harder instead of softer. The true plasticizing action of a plasticizer only becomes apparent when it is present in larger concentrations. These assumptions are confirmed by data obtained from tests made with numerous plasticizers, pure PVC, vinyl chloride copolymer, plasticizer to which a precipitant had been added, and finally two polyvinyl chlorides of different molecular weights. A critical discussion on recently published work on the subject is also given.

*Shear effects in glass-fiber-reinforced plastics laminates.* R. E. Chambers and F. J. McGarry. ASTM Bull. No. 238, 38-41 (May 1959). By simple bending tests over span-depth ratios of 7 to 70, the variation in apparent flexural modulus is shown to result from interlaminar shear stresses set up in the specimen by the applied central load. The interlaminar shear modulus of the laminate, determined by this technique, approximates the shear rigidity of the pure resin. The true flexural modulus, measured from pure bending tests, is the average of the tensile and compressive moduli, in accordance with rational expectations. The variation of apparent flexural strength with span-depth ratio in simple bending appears to be related to the tensile ductility of the laminating resin. The magnitude of apparent flexural strength appears to depend primarily, though not exclusively, upon the strength characteristics of the resin.

### Testing

*Paper chromatographical analysis of dicarboxylic acids in polyesters.* R. Kayler and I. Lenz. Kunststoffe *49*, 222-25 (May 1959). Possibilities regarding the conversion of dicarboxylic acids in polyesters by means of saponification of the ester with alcoholic alkali are discussed. To avoid analytical inaccuracies resulting therefrom, the polyester should be decomposed with aqueous alkali. Paper chromatographical methods of separation and identification of the dicarboxylic acids frequently found in polyesters are described, both in an ester mixture and after hydrolysis of the ester.

*Further development and use of the Armstrong sandpaper abrasion machine.* F. M. Gavan. ASTM Bull. No. 238, 44-48 (May 1959). The Armstrong abrader has been in continuous use since 1941 for evaluating the sandpaper-abrasion resistance of smooth-surface resilient floor coverings. During that time the design of the machine has been modified without changing essential characteristics. The machine is now available commercially. Various operating techniques have been devised. Comparisons with certain other machines available today are shown. A half-size model is described.

### Publishers' addresses

*A.S.T.M. Bulletins:* American Society for Testing Materials, 1916 Race St., Philadelphia, Pa.

*British Plastics:* Iliffe & Sons, Ltd., Dorset House, Stamford St., London SE1, England.

*Chemical and Engineering News:* American Chemical Society, 1155 Sixteenth St., N. W., Washington, D. C.

*Chemical Week:* McGraw-Hill Publishing Co., Inc., 330 W. 42nd St., New York 36, N. Y.

*Kunststoffe:* Karl Hanser Verlag, Leonard-Eck-Strasse 7, Munich 27, Germany.

*Materials in Design Engineering:* Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y.

*Missiles and Rockets:* American Aviation Publications, Inc., 1001 Vermont Ave., Washington 5, D. C.

*Modern Packaging:* Modern Packaging Corp., 575 Madison Ave., New York 22, N. Y.

*Plastics (London):* Temple Press, Ltd., Bowling Greene Lane, London EC1, England.

*Plastics Progress in India:* Chowpatty Chambers, Sandhurst Bridge, Bombay 7, India.

*Rubber Age:* Palmerton Publishing Co., Inc., 101 W. 31st St., New York 1, N. Y.

*SPE Journal:* Society of Plastics Engineers, Inc., 65 Prospect St., Stamford, Conn.—End

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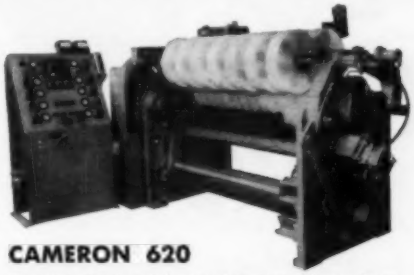

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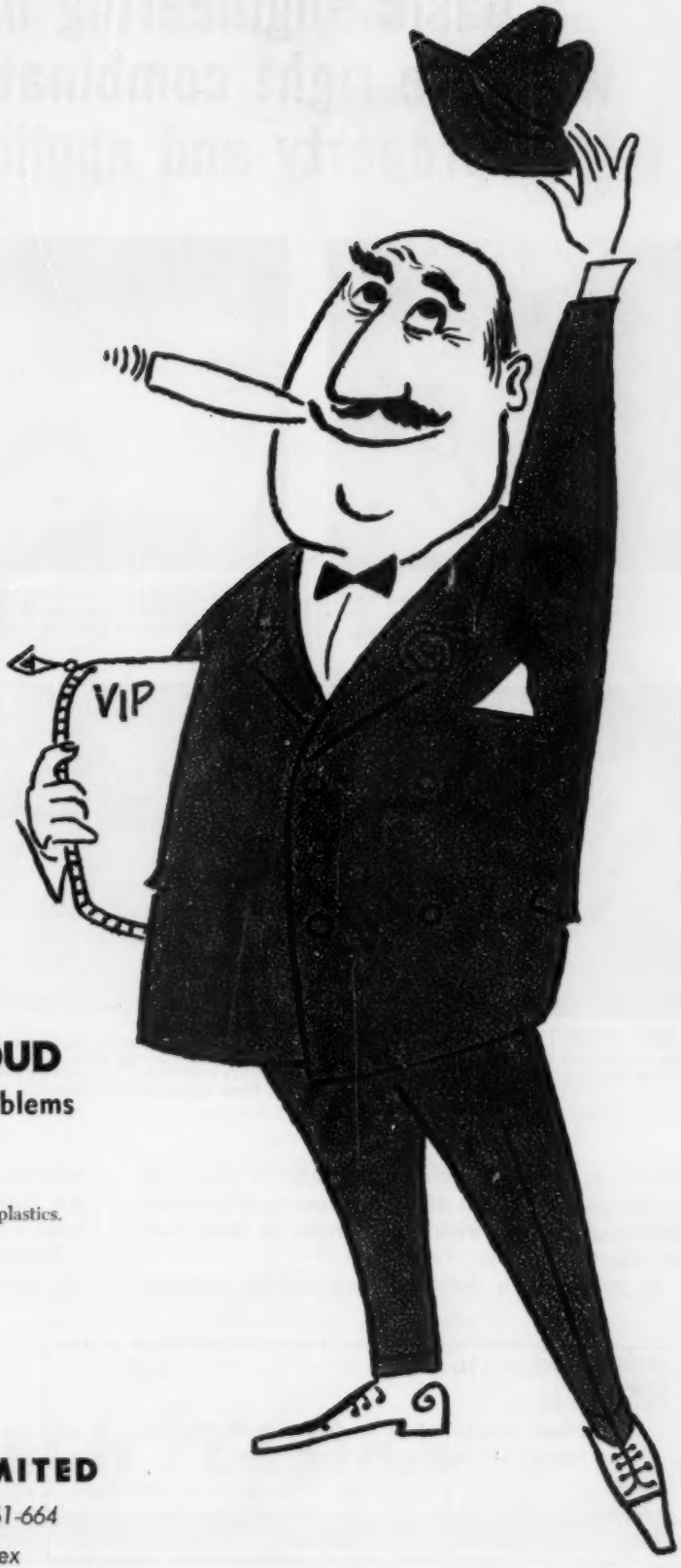


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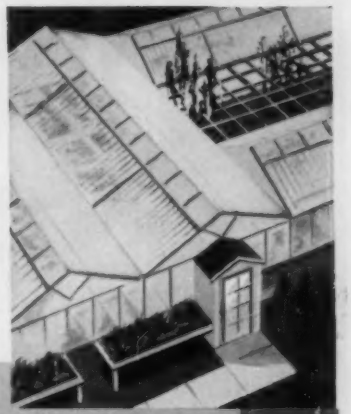

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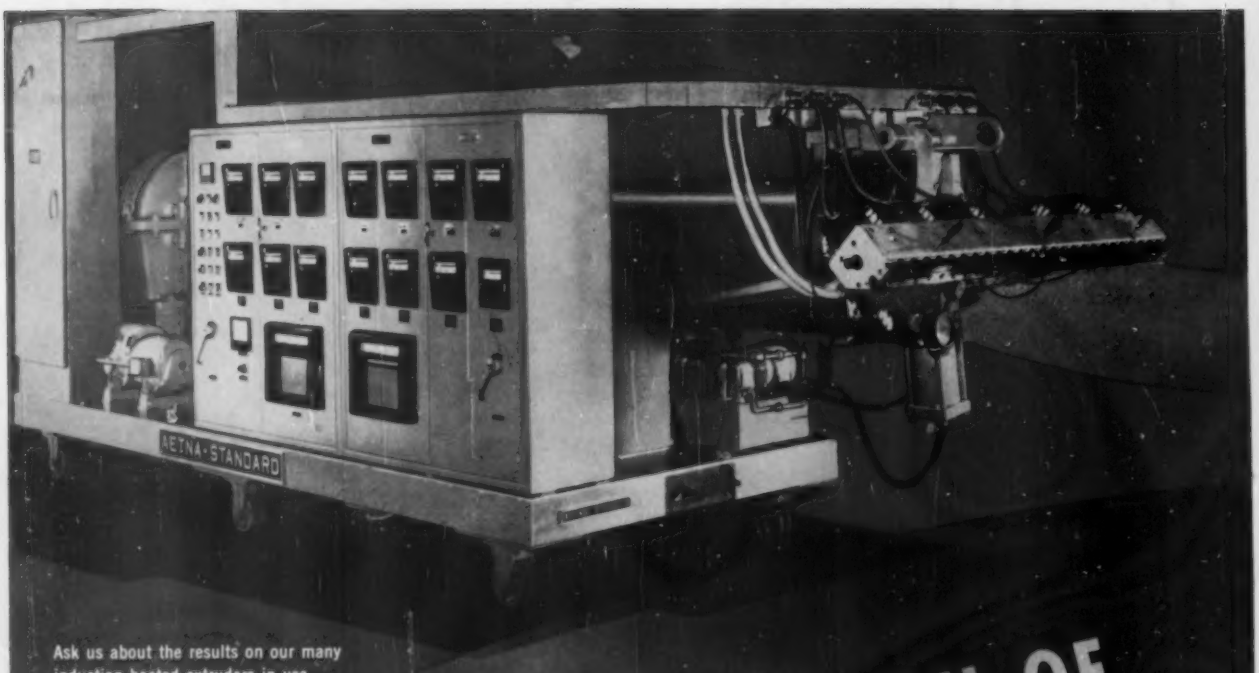


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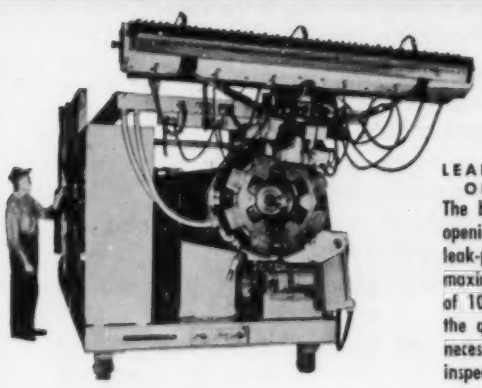

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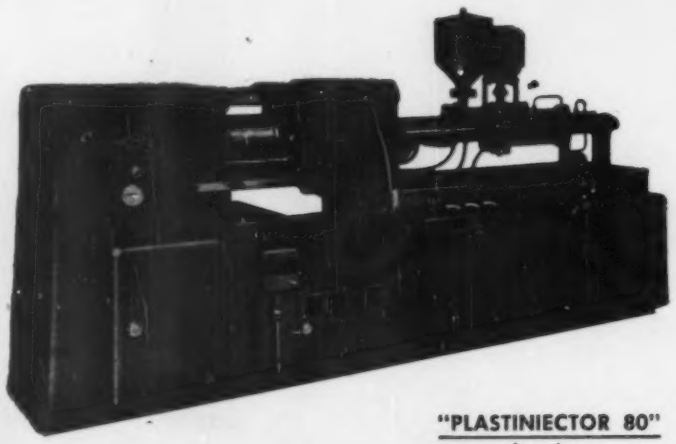

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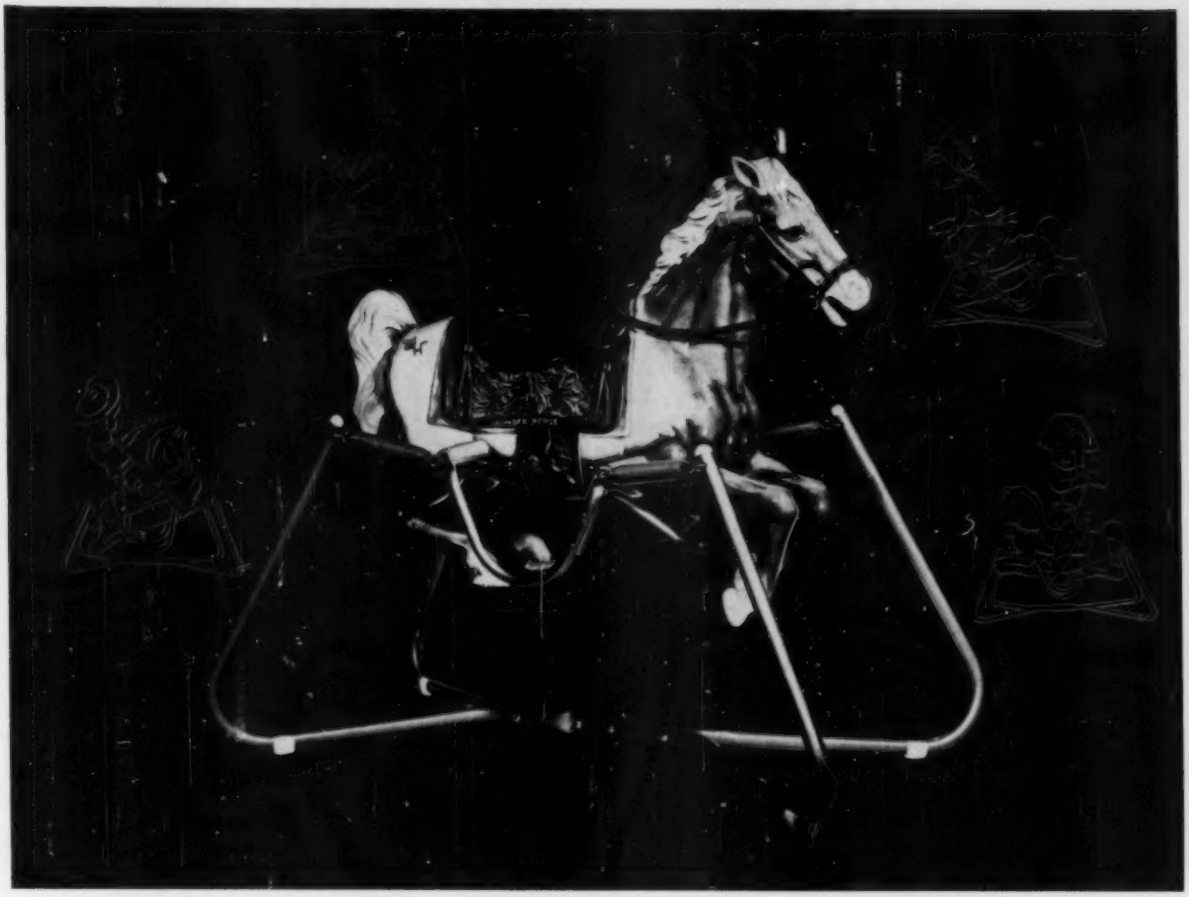

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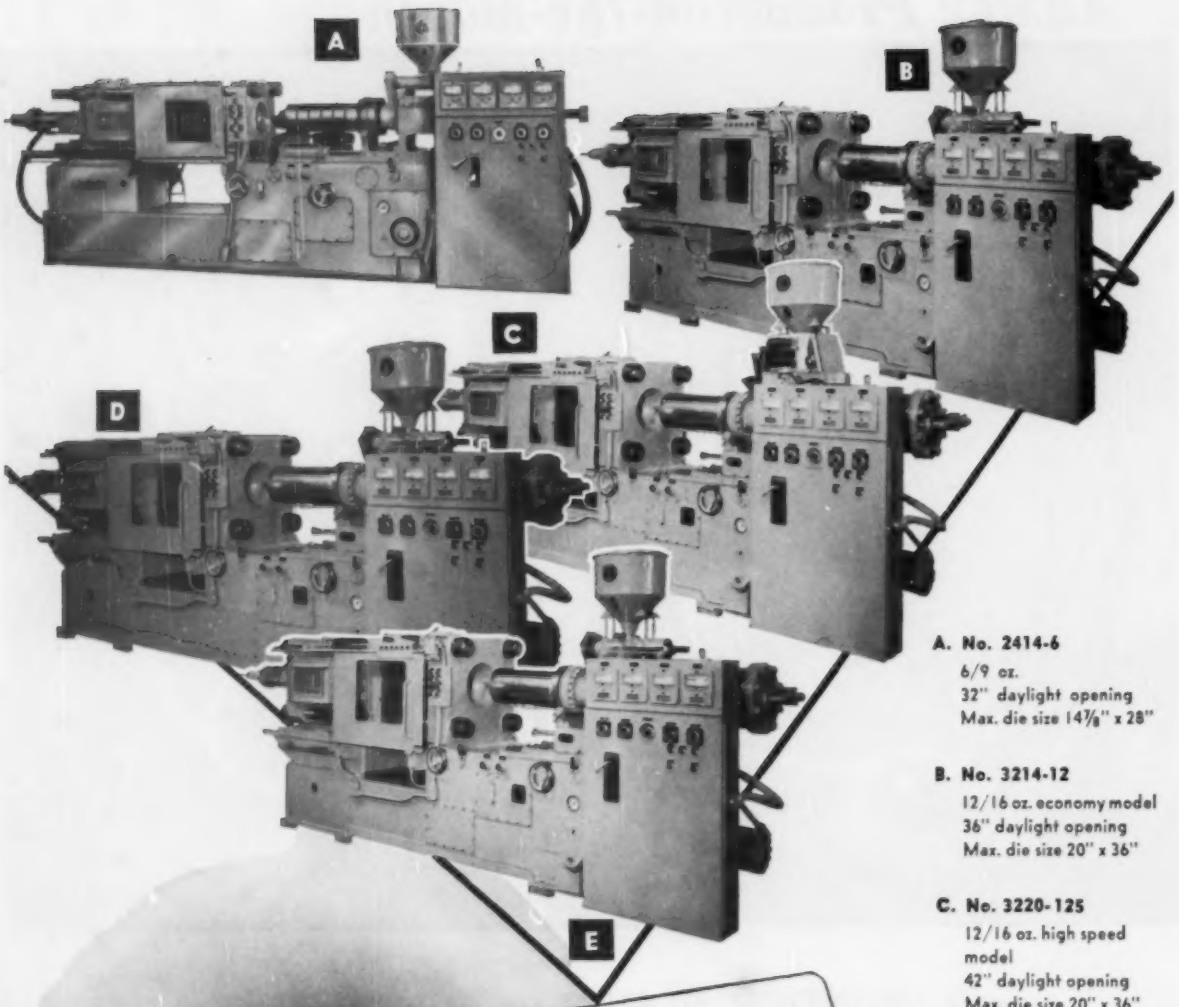


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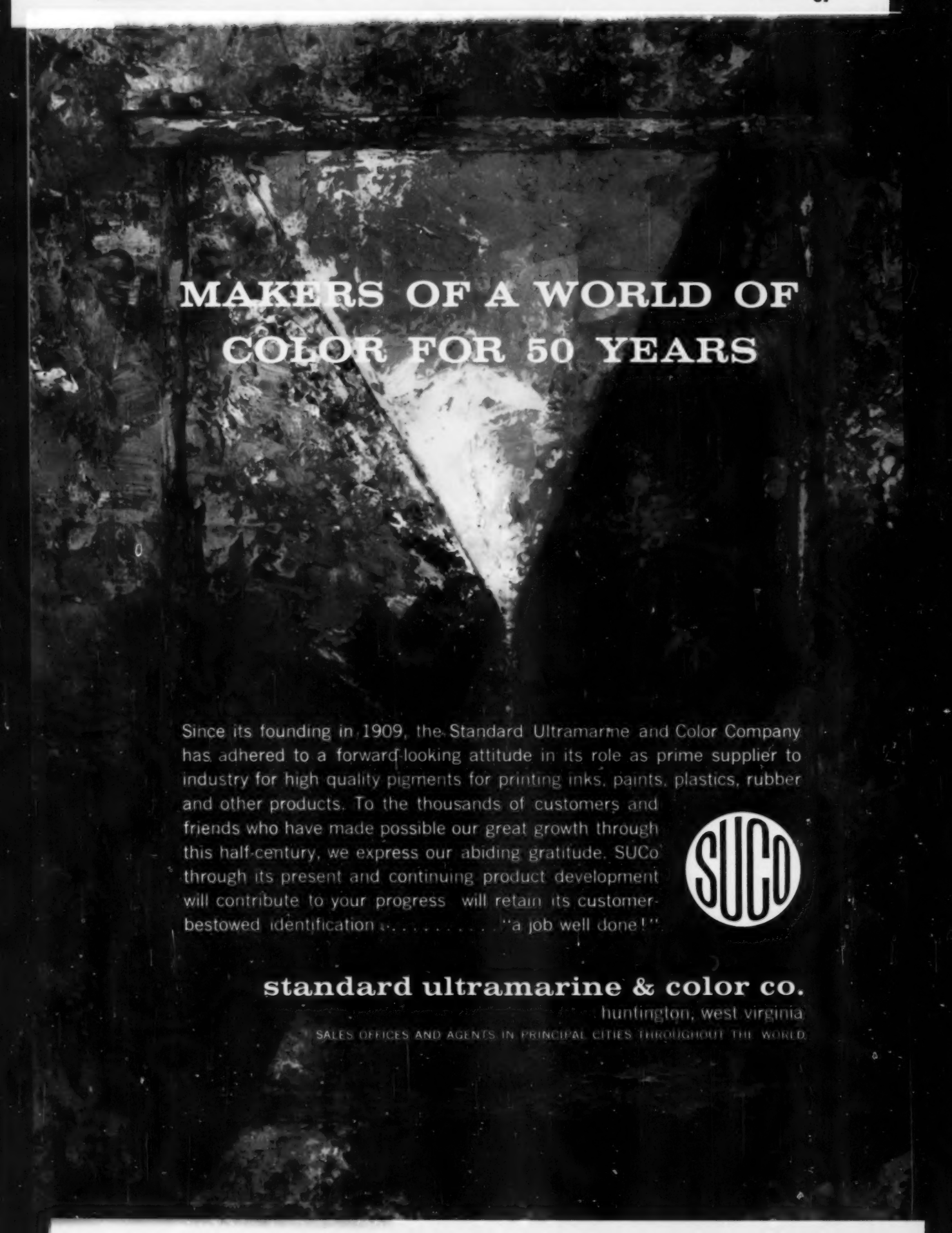
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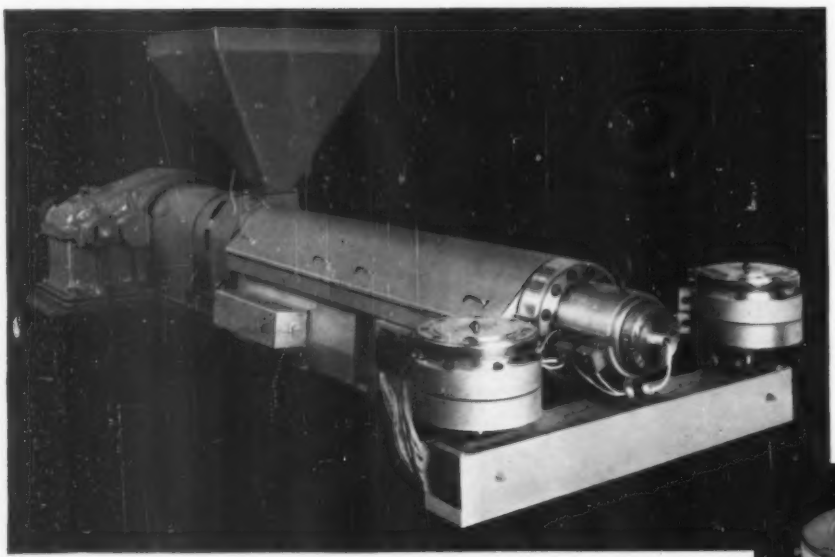

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***More uniform gauge***
***Better quality film***

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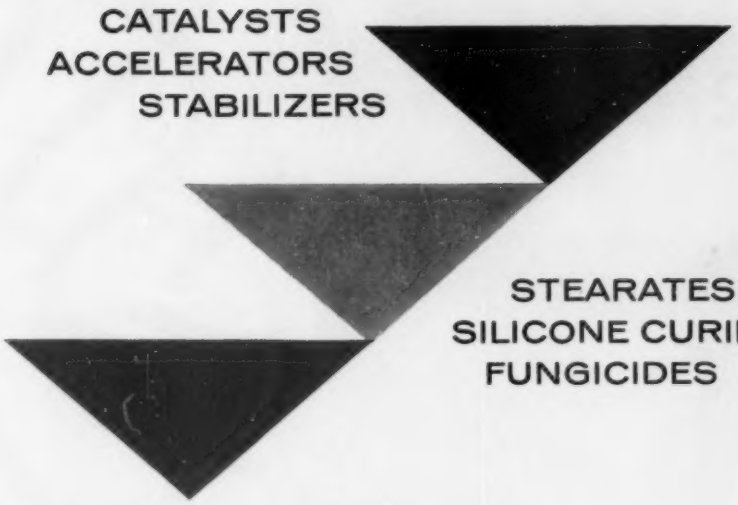


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Nuodex offers a complete line of nine *certified quality* catalysts and accelerators for the polymerization of polyester, styrene and vinyl monomers, including Benzoyl, Lauroyl and M.E.K. peroxide catalysts as well as Cobalt accelerators. The growing family of Nuodex vinyl stabilizers now includes 24 different products identified as *Nuostabes*. A broad range of calcium, zinc, magnesium and lead stearates . . . ten silicone curing agents known as Silicures® . . . plus a line of fungicides developed for plastics . . . together give you the widest choice of special purpose chemicals available from one source.

For a complete listing of Nuodex products, see pages 483-488 in Chemical Materials Catalog.

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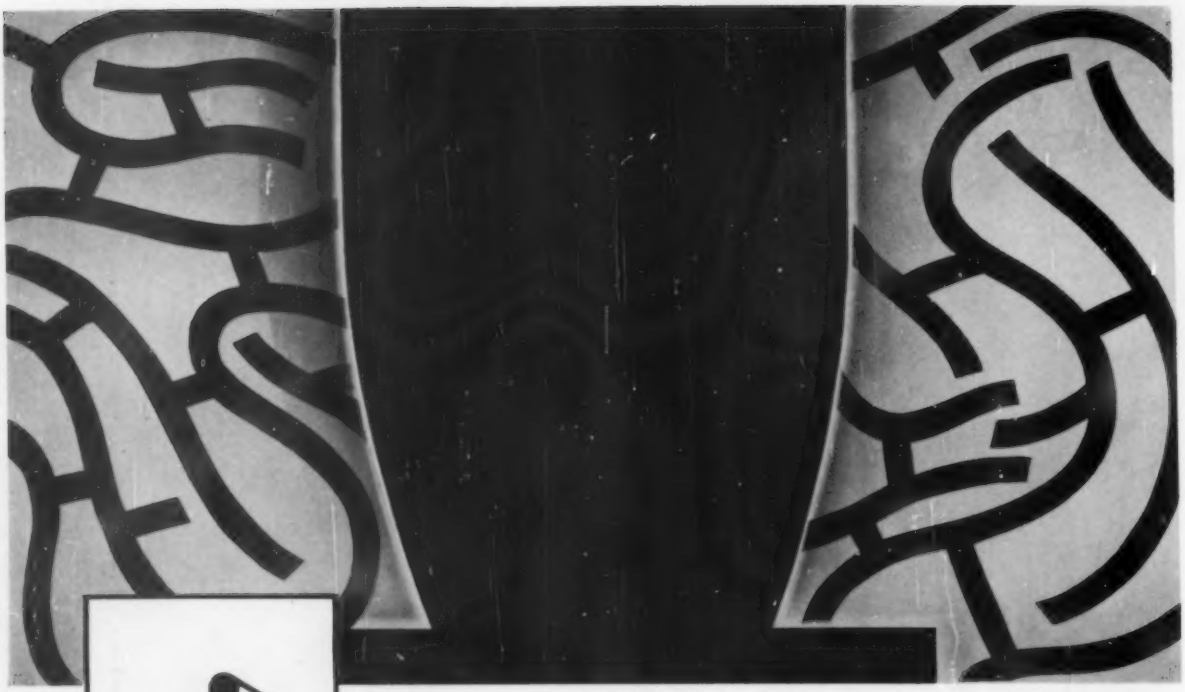

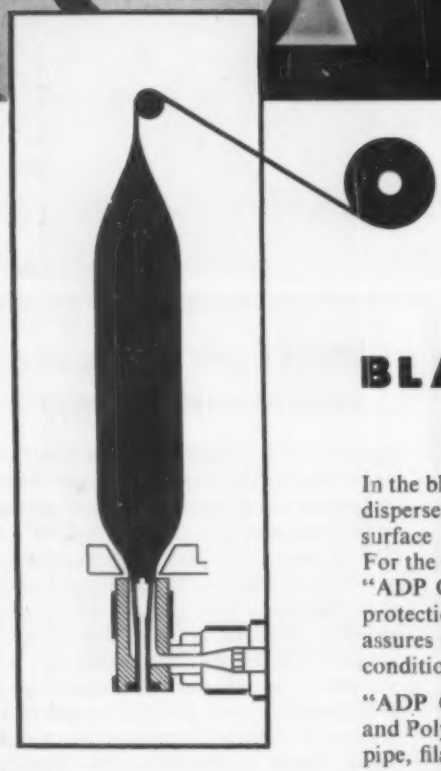

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In the blown-film extrusion of thermoplastic resins, only *completely* dispersed carbon black can assure the uniform jetness and smooth surface texture required to meet top product quality standards. For the manufacture of agricultural film and sheeting, for example, "ADP Quality" black Polyethylene concentrates give a degree of protection against deterioration from ultra violet sun rays that assures maximum serviceability under the most extreme exposure conditions.

"ADP Quality" carbon black dispersions in Polyethylene, PVC and Polystyrene resins permit equally superior coloration of plastic pipe, filament and flat-film extrusions.

ADP concentrates of black and all standard colors are supplied in dry granular dispersions for ease of handling. Ultra-fine dispersion of pigment particles provides *extra tint strength* for color-stretching economy. Send for samples to meet your specified requirements . . . or let ADP specialists work with you to solve your coloring problems.

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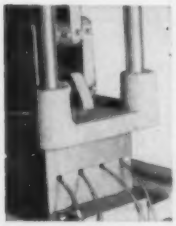
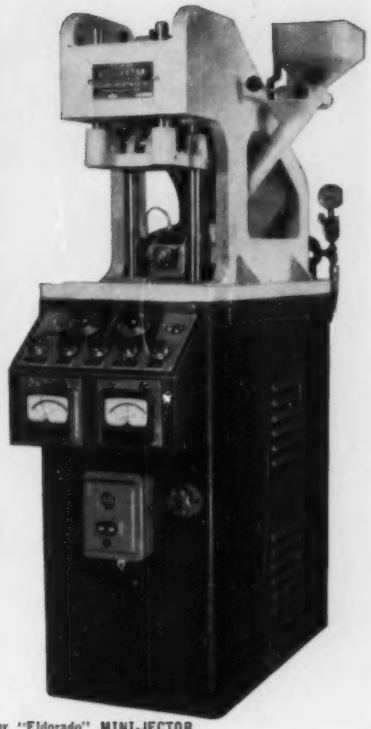
# "Eldorado"
# MINI-JECTOR

Reg. U. S. Pat. Off.

### *PLASTIC INJECTION MOLDING MACHINES*



Typical example of insert molding on "Eldorado" MINI-JECTOR. *Left*—Close up of mold in open position. Note unobstructed access to mold area. *Center*—Close up of mold in closed position. *Right*—Cycle completed. Molding of cord endings shown represents only one of hundreds of applications, but as they are familiar objects, it is easy to visualize the capacity range of "Eldorados."



Super "Eldorado" MINI-JECTOR, model 70VC105 (above) offers semi-automatic operation in addition to all the advantages of the Standard "Eldorado," model which is lever controlled.

**For fast, low-cost** production, especially of parts involving inserts or loose cores, "Eldorado" MINI-JECTORS are ideal. Specifically designed for this type of molding, "Eldorado" MINI-JECTORS are producing every day a wide variety of precision parts (up to 1½ oz.) in **all** thermoplastics. "Eldorado" MINI-JECTORS are hydraulically operated. Available for semi-automatic operation or with lever controls.

### *There's a MINI-JECTOR to fit your needs!*

MINI-JECTORS are available in 3 basic models. "WASP" models have self-clamping "V" molds—ideal for sub-miniature to ¾ oz. items especially those involving inserts or loose cores. "HORNET" models feature horizontal clamping—capacity up to 1 oz. "ELDORADO" models feature high speed molding, especially of parts involving inserts or loose cores up to 1½ oz.

Two of the popular stock MINI-JECTOR models. **Left**—"Wasp," with air or hydraulic power provides capacity from sub-miniature to ¾-oz. Uses small "V" molds. **Right**—"Hornet" MINI-JECTOR has horizontal clamping and mold area of 6" x 5 1/8" x 5". Molding capacity up to 1 oz.

## You'll like these outstanding "Eldorado" features:

- **No front tie rods** to hinder operator's easy access to mold area when mold is open.
- **Vertical Clamp Operation**—Inserts or loose cores remain undisturbed because bottom of mold is always stationary.
- **Simple to Operate**—No special skill needed for efficient operation.
- **Hydraulic Power**—Self-contained Vickers hydraulic system powers mold closing and injection.

**Write for FREE Catalog—Today!**

*New, over 50 pages of detailed, illustrated, complete engineering data and specifications on all MINI-JECTOR models and accessories. Contains complete price list.* Many money-saving exclusive features. Shows how MINI-JECTOR helps you develop and produce molded plastic items (sub-miniature to 1½ oz.) more profitably than by other methods. Mail coupon today!

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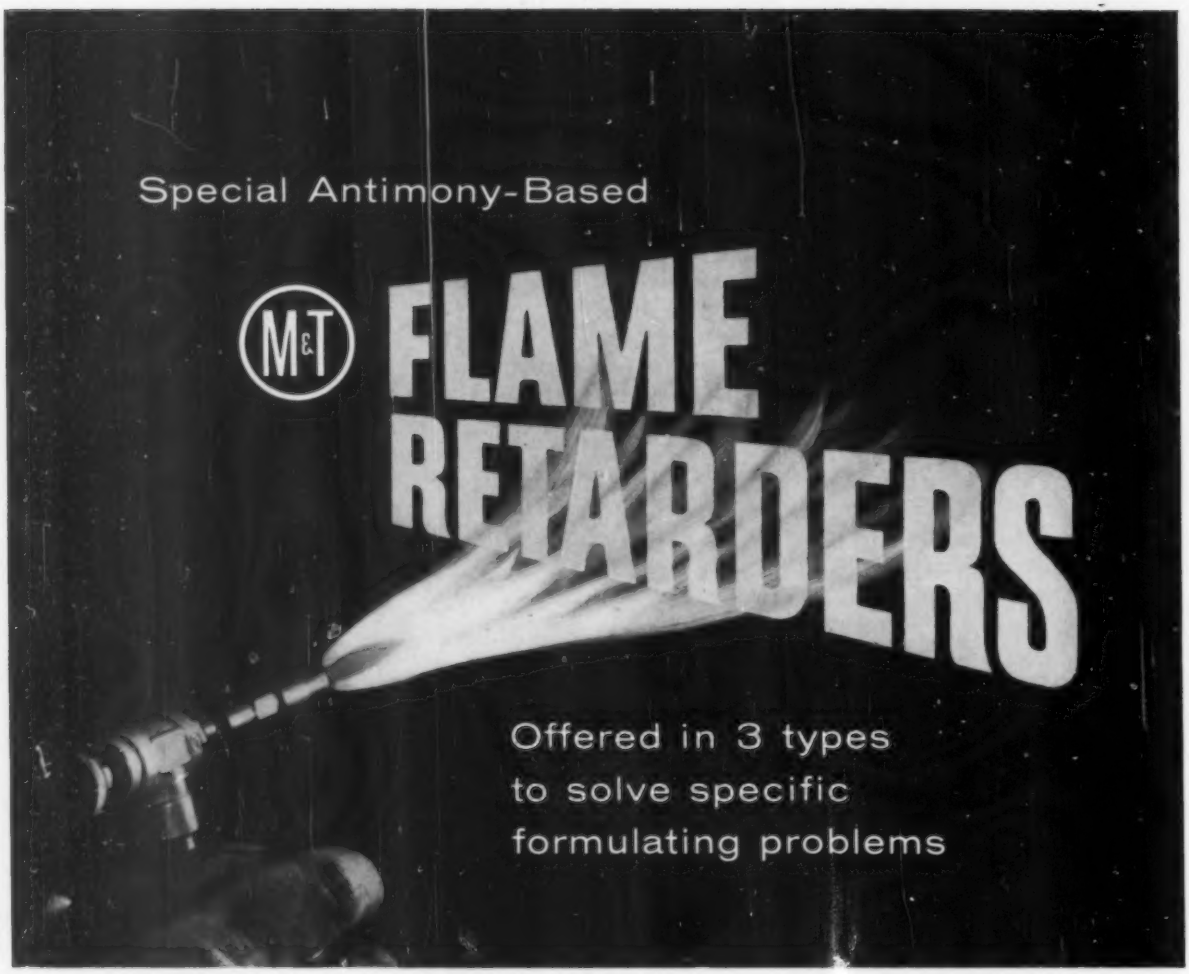


**THERMOGUARD* "H"** *High Tinctorial Strength* $Sb_2O_3$

For production of whites and pastels, this strong white oxide delivers uniform color from batch to batch. Rigidly controlled for high tinting strength during manufacture, this antimony oxide assures you consistent results without changing formulations.

**THERMOGUARD* "L"** *Low Tinctorial Strength* $Sb_2O_3$

In this product the flame retarding properties of antimony oxide are available with *minimum opacity*. It is a pure white oxide which does not interfere with the low cost formulation of flame-resistant deep colors.

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*... and for Translucent coating and films*

**M&T FLAME RETARDER**

This antimony-based flame retarder has *one-fifth the tinting strength of antimony oxide*. It permits lower cost production of flame resistant products which are semi-transparent or contain high-cost pigments and toners.

**Antimony chemicals** act in conjunction with chlorine-containing compounds to provide flame-retardant action. When chlorine is not present in the resin the incorporation of chlorinated waxes or other chlorine-containing organic materials will serve this purpose.

**Your requirements** for flame-retarding characteristics can be discussed in detail with M&T's Technical Service Department. Write or call for information.

M&T **Chemicals**

Sn Sb P | organometallics
Si Ti Zr | and inorganics

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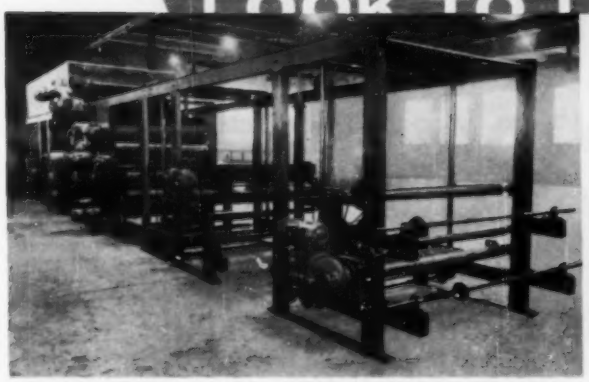

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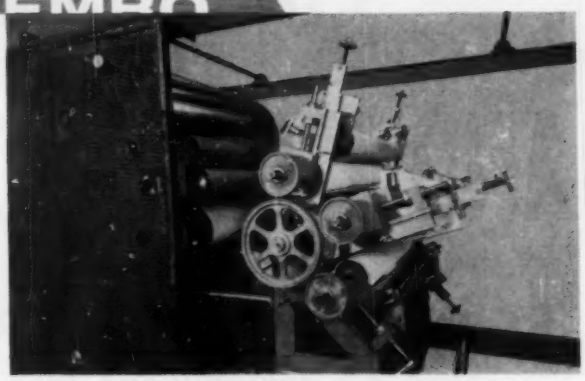

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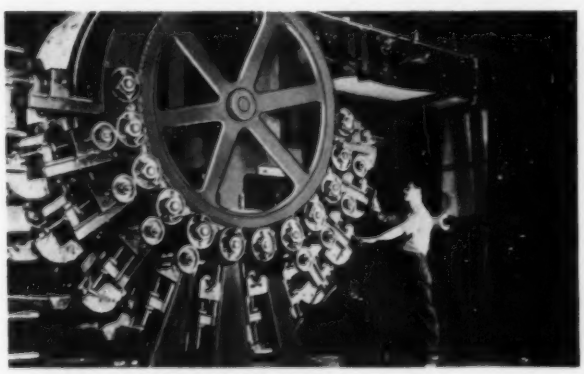
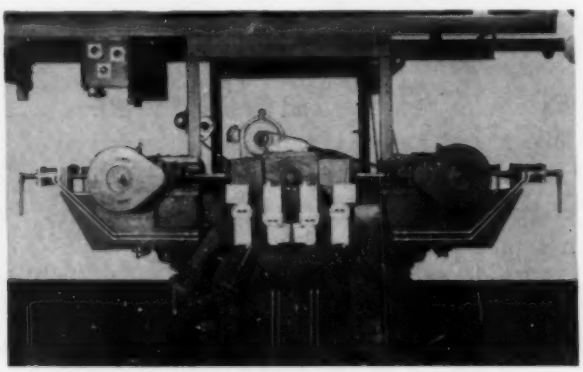
Prints 1 to 3 colors on all plastic and plastic-coated film up to 80" wide. Available with variable control and manual or hydraulic pressure nips.



12-COLOR SURFACE PRINTER

For plastic film, nylon, glass, coated fabrics and all textiles. High speed printing in 1 to 12 colors. Accurate, easy 360° registration.



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EXTRA! New, aluminum Slat Expander now standard equipment on all Lembo Presses and Embossers. Maintains constant width on 60 or 80" face.

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There is only one Lembo Machine! Be cautious of "Lembo-type" imitations.

# FERRO DEVELOPS AND TESTS NEW LIGHT STABILIZER FOR POLYETHYLENE AND ISOTACTIC POLYOLEFINS*

## New Ferro AM 101 extends useful life of sunlight-exposed polyethylene from 200% to 500% . . . cost expected to be only half that of ultraviolet absorbers

Extensive research and testing at Ferro's laboratories and in the field have proved the value of a completely new stabilizer which is chemically distinct from ultraviolet absorbers and far more effective.

When AM 101 is incorporated into resin systems, the resulting sheet, film and fiber remain stronger, more flexible and more extensible . . . with a useful life from 2 to 5 times better than heretofore possible.

Tests have proved these findings on both linear and branched polyethylenes. Tests on polypropylene have been even *more* successful.*

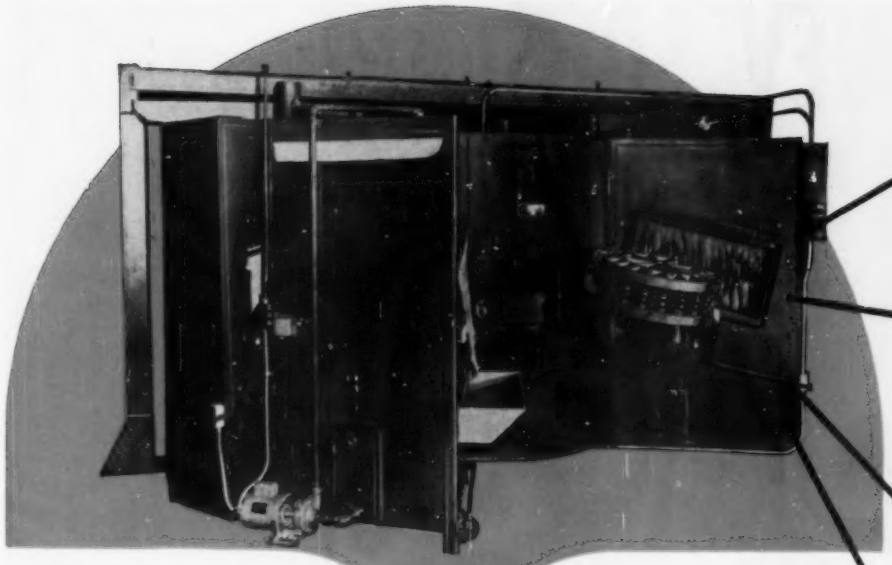
While optimum concentration varies from as little as 0.25% to 0.5% (depending on source of polymer and conditions or methods of processing), cost of Ferro AM 101 is expected to be about half that of conventional ultraviolet absorbers.

Write for data sheets, samples and specific technical information.

•

**Patent rights throughout the world are under exclusive license to Hercules Powder Company for use in isotactic polypropylene and higher isotactic polyolefins.*

FERRO CHEMICAL (A Division of Ferro Corporation) Bedford, Ohio



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Yes, it seems like magic the way this machine converts raw material into finished goods, in one continuous operation. With only one man at the controls, polyvinyl chloride plastisols, vinyl foams, polystyrene expandable beads and polyethylene blends are automatically dispensed and rotationally molded to shape, completely controlled by the automatic features of the machine. The operator need not be a technician, because all the raw materials are scientifically prepared, using all the technological advances made by the nation's foremost companies. Now, any hollow article can be molded from these raw materials, thus creating countless new product possibilities. With a high hourly production and a low hourly cost, it naturally follows that units produced on this machine are BIG PROFIT items.

**LET US SHOW YOU HOW TO DO IT!**

We want to demonstrate our "magic" to you. Visit our plant and let us mold YOUR PRODUCTS, right before YOUR EYES . . . like "magic".

***Write or call for detailed data or an appointment.***

**NOW . . . even BIGGER!**

Machines are available with a 15", 25" and 75" molding area, capable of molding items eight times larger than previously thought possible, such as the unicorn, shown here. Imagine, it's automatically molded in one operation!

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**NOTABLE BEARINGS**—These unique bearings are typical of the laminated products which American Brakeblok—a division of American Brake Shoe Company—makes for steel mills, for marine uses and for other industrial applications. American Brakeblok, which is one of the largest manufacturers of friction materials in the United States, fabricates these bearings from materials which are impregnated with phenolic resins. The materials themselves can be formed into finished or semi-finished shapes, and even bonded to metal. They can be machined to extremely close tolerances. Marketed under the brand name of A-B-K, one of their primary uses is in the construction of heavy-duty, water-lubricated bearings which must be able to withstand tremendous shock loads and stresses, without peening or setting. A-B-K bearings are able to outlast metal bearings many times over. Among the materials used for the fabrication of A-B-K products is Mount Vernon Duck.

This is another example of how fabrics made by Mount Vernon Mills, Inc. and the industries they serve, are serving America. Mount Vernon engineers and its laboratory facilities are available to help you in the development of any new fabric or in the application of those already available.

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# CAMPCO PROGRESS

*latest developments in plastic sheet film fabrication*

## New Thermoplastic resists heat, chemicals, electricity

### Campco Polypropylene

A new wide area of product fabrication from thermoplastics is now possible with recently introduced Campco Polypropylene sheet. Because of an unusual combination of dielectric, chemical and heat resistant properties . . . the material is especially useful for electric appliance parts, chemical vats, ducts and fittings, and items requiring sterilization.

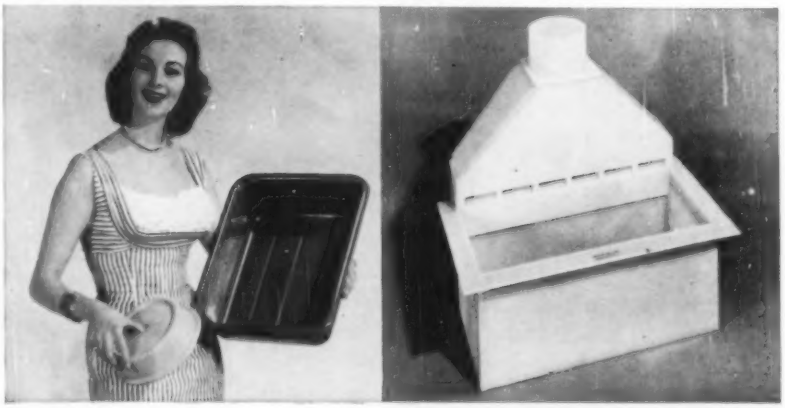
Compounded by stereospecific polymerization of low cost propylene gas, the new plastic is highly impervious to stress cracking and can withstand temperatures to 240° F. under average load service conditions. This makes it ideal for food service and hospital items that must be boiled or autoclaved.

The plating tank illustrated below takes advantage of these same properties and also the material's fine behavior under chemical attack. It can be custom fabricated to size with a fuel hood and connection for exhausting vent heat.

Campco Polypropylene has good rigidity and strength in thin sections . . . and has the lowest specific gravity of any plastic material (0.91). Thus, more products can be produced per unit weight of Polypropylene than from any other formable sheet material. In gauges .010" to .025", widths to 40", wide range of colors.

Deep draw, multi-curved dish cover and tote box of Polypropylene.

Plating tank of Polypropylene by American Agile Corp., Bedford, Ohio.



## Puts "Boys" On Wheels

### Campco Tripolymer Styrene Sheet

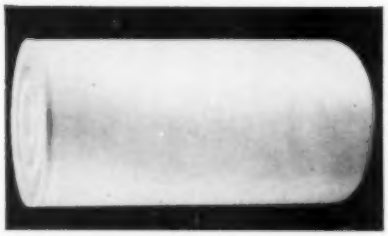
. . . for toy automobiles and the real thing, Campco Tripolymer Styrene Sheet has become a logical choice of leading manufacturers. Its high impact strength at extremely low temperatures and high rigidity make it a *natural* for many automotive applications. For the toy car it serves as a durable "boy-resistant" body that lasts longer than metal. And for Dad's car has many uses as headliners, scuff boards, center post covers, interior door panels and seat backs.

Campcolite has excellent chemical resistance, low moisture absorption, exceptional dimensional stability. Of special note is its high tensile and flexural strength. It machines readily too, and can be rapidly die-cut to accurate size and shape. Sheets can be bonded together by using commercially available cements, or welded with heat and pressure.

These properties and a relatively low cost, together with a full range of colors and the fact it lends itself to all conventional forming techniques . . . recommend Campcolite for many jobs now using more costly materials.

Available in smooth or Haircell grain embossed finish. Special effects can be had by incorporating grain in forming dies. Gauges .020" to .125".

## New Linear Polyethylene Tank of Campco Sheet



This all-plastic tank is a product of Premier Plastics Co., Milwaukee, and is one of the many commercial products now being formed from Campco Linear Polyethylene. The material's unusual combination of rigidity, heat and chemical resistance make possible many distinctive applications. It withstands a variety of chemicals including even some acids which attack glass . . . is exceptionally rigid and tough with good dielectric properties. Easily forms, machines. Recommended for both industrial and consumer products—housewares, containers, electrical products, toys. Gauges .020" to .125", custom sheet and rolls.

### One Reliable Source

Now you can fill all your requirements for thermoplastic sheet and film from one reliable source. Campco now offers Butyrate, Acetate, Styrenes, Polypropylene, Nylon—in sheets or rolls depending on gauge . . . cut to size if desired . . . clear or colored transparent . . . translucent or opaque.

**Received Your Campco Personal File?** This data-packed reference file on thermo-plastic sheet and film is yours on request—just send name and address on Company letterhead to Campco, 2721 Normandy Avenue, Chicago 35, Illinois.

**CAMPCO** Sheet and Film, **a Division of Chicago Molded Products Corp.**

September 1959, Volume 37, Number 1

MODERN PLASTICS

# What about FLAME RESISTANCE in plastics?

***Here is a rundown on the codes, regulations, tests, and standards that the plastics industries face—plus the problems involved in making plastics self-extinguishing***

As more and more plastics move into building construction, as more appliances containing more plastics are built, agencies interested in fire safety are requesting meaningful information on the properties of plastics which bear on the fire hazard involved in these uses of plastics. The plastics industry finds itself deeply involved in trying to satisfy this demand and the demands arising from the enforcement of insurance regulations, building codes, electrical codes, and fire codes.

Unfortunately a) there are many competing rule-makers; b) the nomenclature of flammability is a heterogeneous mess; c) there is a vast inarticulateness between the agencies who write the rules, the technologists who create the plastics, and the engineers and designers who use the plastics; and d) some of the tests used to evaluate flame resistance in plastics were designed for other materials and create frustrating problems for all concerned.

The rule-makers are concerned with safety. They care not at all about either costs or engineering function. They say, in effect, "The plastics industry has huge well-financed laboratories staffed by thousands of scientists. Let them make plastics that meet our safety specifications!" Just like that they expect the industry's Merlins to whip up a batter of transparent stainless steel! And the builders and other users would like to see such a miracle priced at 10¢ a pound!

Are the makers of plastics doing anything about this? Yes. What are the problems? What is being done now? We'll take that up in turn; meanwhile, let's look at the rule-makers.

There are thousands of city, county, state, and even township building codes. Many of these are based on one or another of the model codes offered by one of the four groups which sponsor either regional or national model codes. These four building code groups are as follows:

International Conference of Building Officials (ICBO), which sponsors the Uniform Building Code. This contains the now-famous Chapter 52, the Plastics Chapter, which is to date the most reasonable approach to plastics in construction. It is sometimes referred to as "The San Francisco Chapter," because it was written in that California city.

Southern Building Code Congress, sponsors of the Southern Building Code.

Building Officials Conference of America (BOCA), which is the sponsor of the Basic Building Code.

National Board of Fire Underwriters, which sponsors the National Building Code. This organization helps to fi-

nance the non-profit Underwriters' Laboratories, chiefly concerned with testing the fire properties of building materials and with the over-all safety of electrical appliances.

None of these different codes has any force of law until officially adopted by a city or town, and then only when and where so adopted. There is keen competition to secure local adoption of particular codes.

Then there is a non-code-writing organization, the National Fire Prevention Association (NFPA), comprised of fire safety engineers including metropolitan and state fire marshals. NFPA develops fire safety standards for building design, materials handling and storage, and standards for fire protection and fire fighting equipment and devices. NFPA's purpose is to prevent loss of life, and to limit the hazards to firemen themselves through training and education. The NFPA works with all code-making authorities in all areas, on all materials and with industry groups concerned with materials and equipment.

Building codes generally don't cover contents of a structure except in generalities. But as more appliances are built in, we may expect more attention will be paid this matter. That's where U. L. is involved right now.

#### Plastic committees' objectives

On top of all these, we have the various federal government specifications and standards, including the three military services and the National Bureau of Standards. And, of course, the American Standards Association and the American Society for Testing Materials, two of whose test methods are prominent right now: ASTM D 635, for determining rate-of-burning of plastics of 0.050 in. and over; and D 568, for rating plastics of less than 0.050-in. thickness. These are the tests used in legislation all over the country to classify plastics and to eliminate from use in buildings and appliances any rapid burning plastics.

Working with all these rule-makers on behalf of the plastics industry are committees from The Society of the Plastics Industry, Inc., Manufacturing Chemists' Association, and with them, committees composed of members from the Building Research Institute and the National Association of Home Builders.

Main objectives of these committees are a) to bring some order into the nomenclature of fire hazard, relating test methods to materials on the one hand and hazard on the other; b) to relate engineering and design to function and all three to safety requirements. A good example of the latter is the use of plastic diffusers in flush-mounted ceiling installations, where, using a limit of 30% of plastics to a given area, and making the plastics use non-continuous, you can still get plenty of light, with complete safety even though the plastic employed is "slow-burning" rather than self-extinguishing. In most cities the plastic must be self-extinguishing or better, if employed on a 100% basis. Another good example is found in the panel story on the opposite page.

#### Terms and what they mean

Their problems with glossary are prodigious. Flammable, inflammable (same thing), non-flammable (the opposite), fireproof, slow-burning, fast-burning, combustible, incombustible, relatively non-flammable, self-extinguishing, flame resistive, fire resistive, flameproof, fire retardant, are some of the terms in use, most of which are not related to test procedure.

Only a few of these words mean much at present. Fireproof or fire-resistant, as used in building codes, means that the material or assembly is a barrier against the spread of fire in terms of 1 to 4 hr. in the test furnace. (There's a real Hades-type inferno used as the standard test to determine fire resistance.) Incombustible or non-flammable, as used in such codes as the New York and Uniform Code, means that the material will not ignite at or below a temperature of 1200° F. during exposure of 5 min., and in addition, will not continue to burn or glow at that temperature. Probably the safest set of words are those used by the National Board of Fire Underwriters in its Research Report #1 "Fire Hazards of the Plastics Industry," incombustible, self-extinguishing, slow-burning and rapid burning.

#### Questionable tests

There are two tests which the plastic industry believes are informative but the industry maintains that they cannot be a) applied to all plastics or b) used to determine what plastics are safe and which are unsafe for specific uses. One is the "tunnel test," invented three decades ago as a standard test method for interior finishes and now written into nearly every building code—also recently used to evaluate some plastics applications which may not be subject to such uses.

The tunnel calls for a test specimen 25 ft. long, 20 in. wide to be attached to the concrete slab roof of the tunnel, with flame application

at one end and a blower and stack at the other end to create a controlled draft. Asbestos is given a flame spread and point of "0," and ¾-in. oak is rated at "100," the results on other materials are expressed mathematically in terms of flame spread end points which express a comparative rating with ¾-in. oak and asbestos. The plastics people feel that it is sensible to test plastics in the tunnel and to require plastics to meet the requirements for finishes as determined by the tunnel only when plastics are employed as finishes but not when they are employed in limited areas to transmit light. They argue that the tunnel is a method of test to rate the hazard of a material installed in a continuous surface and not to rate the hazard of a material installed in limited areas in small sections that are required to be separated from one another.

The other test under fire by the plastics industry is the "drip test" suggested by Underwriters' Laboratories. Like the tunnel test, it is felt that it is not closely enough related to the performance to be expected of the product, that the threat of hazard may be used to degrade engineering function.

#### Flame is not the only problem

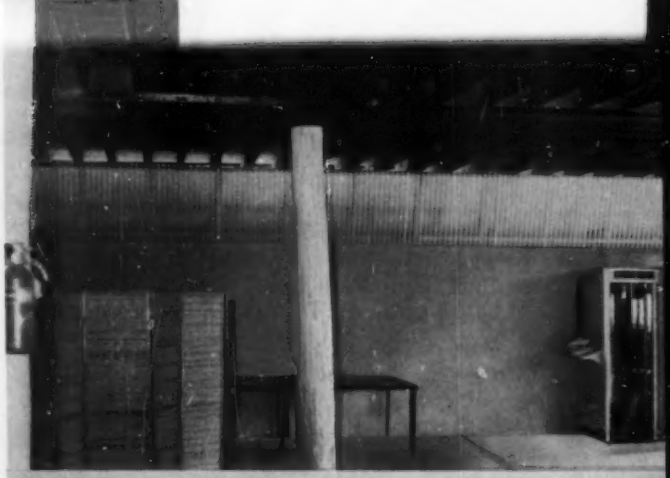
Note that so far only flame has been discussed. What about smoke? BTU's or contributed fuel? Gas and toxicity? Heat distortion temperature? We've seen a so-called flame-resistant plastic, when subjected to continuous application of flame, give off enough smoke to blind an eagle. We've seen places where a low heat distortion temperature is an advantage. And, as to dripping, does the drip travel fast, does it go out or continue to burn, does it glow? It is quite possible, by additives, to render a thermoplastic more resistant to flame, and at the same time make it more subject to drip under heat.

#### Plastics industry efforts

So what are the makers of plastics doing about all this?

In every laboratory in these industries, work on the subject is going on at an accelerated pace. Indeed, it has been going on for more than 15 years.

Companies which have been pioneers in developing legal formulas which provide for the use of both slow-burning and self-extinguishing plastics in buildings and appliances and fixtures have developed forms of their plastic materials which can qualify under both the self-

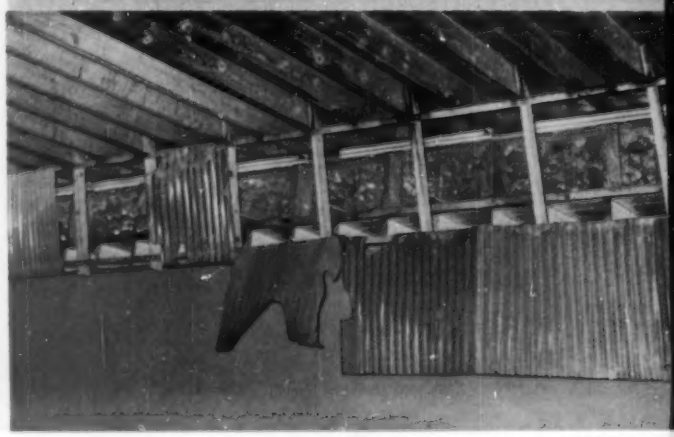


## In fast fires, low heat distortion of plastics can be a safety factor

Here is an example which proves that corrugated acrylic, properly installed, does not constitute a flame-spread hazard of the magnitude indicated by its burning characteristics.

On July 10, 1955 at the Fountainhead Barbecue Restaurant, New Hope, Pa., an attendant, to quicken a barbecue fire, placed a 5-gal. can of gasoline in the middle of the room, poured out a glassful to overflowing, carried it across, and threw it on the glowing charcoal. The gasoline flared immediately and ran along the drippings, igniting the full 5-gal. can. An inferno of flame reached the ceiling and began to burn the oak timbers and the open sheathing.

But when the flame ran along the ceiling, the acrylic paneling became soft, fell out of place and hung along the wall (before, top, and after, below) permitting the flames, the gas, and heat to leave the building. Thus the heat, which had been concentrated against the ceiling, escaped and the fire was easily put out by firemen. Not a single piece of the acrylic burned nor did any of it ignite at any time.



extinguishing and slow-burning classifications. Thus, acrylics as well as vinyls are available in self-extinguishing grades and are extensively used commercially; but, unfortunately, the self-extinguishing grade of acrylic is available only in sheet form.

Research over the past 15 years has not produced a self-extinguishing acrylic molding powder which avoids the difficulties encountered with commercial polymers generally when attempts are made to produce from them a self-extinguishing molding powder. Despite many ingenious approaches to the problem, every formulation that qualifies as self-extinguishing has proved useless as a molding powder for one or more of the following reasons: a) poor moldability, b) corrosion of processing equipment, c) production of irritating or toxic fumes, d) poor dimensional stability, e) poor mechanical properties, and f) low heat resistance characteristics.

**"The hazard involved in the use of a plastic material is a function of all of the properties of the plastic material which affects the behavior of the plastic installation when it is exposed to the conditions of use which can be anticipated in the structure in which it is installed."**

**F. J. Rarig, Secretary, Rohm & Haas Co.**

#### The halogens

An account of the search for the solution to the problem might start with the halogens.

The halogens (chlorine, bromine, and fluorine) have always been the most promising addition agents for imparting self-extinguishing properties to a plastic material. In some cases the halogen is part of the chemical structure; in other cases it is added by means of chemical salts or halogenated wax compounds. Some plastics can benefit fire-wise from phosphate-type plasticizers, which are expensive and may result in loss of other properties. Both fillers—antimony oxide, and glass or asbestos reinforcements—may reduce flaming characteristics.

Some plastics raw materials have inherent self-extinguishing characteristics, but they have limitations which prohibit their wide and universal use. Polyvinyl chloride has approximately 56% chlorine and is, therefore, self-extinguishing—except when combustible plasticizers are used.

The threshold for self-extinguishing properties in vinyl is approximately 30% chlorine and if the vinyl is diluted sufficiently with plasticizers, part of that plasticizer content must be made up entirely from self-extinguishing types such as phosphates.

The fluorine plastics are self-extinguishing and are also sensitive to thermal degradation during melt-fabrication. Their cost is high and thus far have been limited mainly to specialized needs. The polycarbonates are, likewise, self-extinguishing as are the nylons.

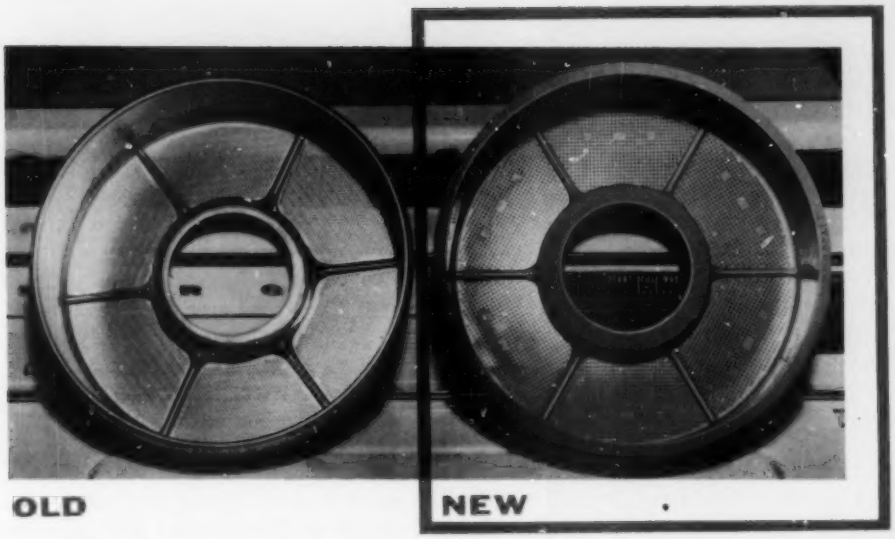
Among the problems of producing self-extinguishing characteristics are those of finding additives which do not decrease the heat and light stability of the base material and which are economical and non-corrosive to molding and other equipment. And when you add the necessity of providing color in many shades and degrees, and when you try to provide molding or other fabrication characteristics similar to that of the base plastic material, the problems are compounded.

#### What about polyolefins?

The polyolefins have received a lot of attention in connection with additives and self-extinguishment. Plasticizers and waxes tend to soften materials which are already soft enough, and when large quantities of halogenated chemicals are added, properties change considerably, and this limits the range of usefulness. Unless extreme precautions are taken, the halogenated chemicals can corrode molds and machinery.

In the case of cellulosics it has been found that the halogens attack cellulose, and that fillers may cause stiffer molding characteristics. Some phosphate plasticizers may reduce heat distortion temperature excessively.

Styrene plastics present a different problem. Phosphate plasticizers can be used, but a great deal is required and that brings about a low heat distortion point. Chlorine can be incorporated in the styrene molecule to make chlorstyrene. The polymer is expensive, however, and has properties quite unlike polystyrene. Halogenated compounds, such as salts, may be used in relatively small amounts with styrene polymers and will produce self-extinguishing properties, although drip **(To page 176)**




**NORGE'S** former aluminum filter (left) and the molded impact styrene filter which has supplanted it (right), both top views. In addition to permanent color and improved appearance, plastic filter resulted in unit cost saving of approximately 65 percent.

**EASILY SNAPPED ON** and off top of phenolic agitator, filter has gasket on bottom which insures secure fit. It also doubles as an automatic dispenser for granular or flake soaps or detergents, which may be loaded into the filter.

# How to make better lint filters

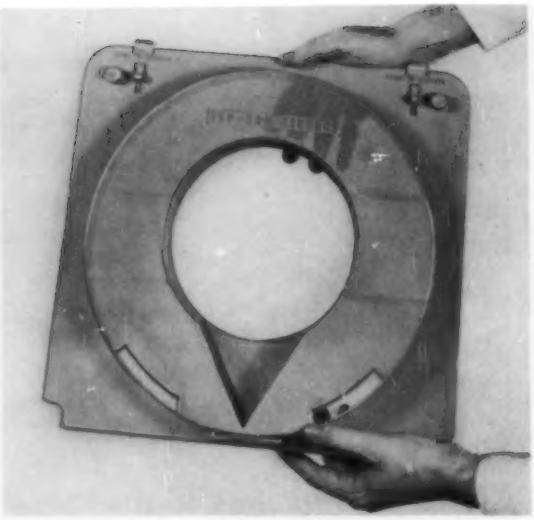
***Three laundry equipment makers turn to thermoplastics to get better components for their machines at cost savings up to 75 percent***

With cost savings running as high as 75% in comparison with metal, it is not surprising that several major appliance manufacturers are specifying molded plastic lint filters and lint screen retainers in their latest model automatic washers and dryers.

In some instances, the plastic filters are replacing metal units. In others, the components were projected from the outset with plastics in mind. At the present time, injection molded high-impact styrene and high-density polyethylene appear to be the chosen materials.

Though important, cost reduction is by no means the only factor. The plastic units are also

**HIGH STRENGTH** of Norge lint filter is attested by fact that it will bear the weight of a man without breaking, and will not crack even if dropped on edge on hard floor surface.



**MEASURING** approximately 15 in. square and weighing 20 oz., Easy's Tip Top lint filter is molded of high-impact styrene material. Spring-loaded "fingers" at the two top corners secure filter in hinged lid of the washer.

much lighter than their metal counterparts, making them easier for the housewife to handle. Their molded-in color, uniform and attractive, cannot wear off in service. Their immunity to rust and corrosion, plus the fact that they are not adversely affected by detergents and bleaches, means that their appearance will endure for the life of the appliance.

Plastic lint filters and lint screen retainers now in use by three leading appliance manufacturers—Norge Div., Borg-Warner Corp.; Easy Laundry Appliances Div., Murray Corp. of America; and The Maytag Co.—highlight the manufacturer and consumer advantages involved. At least one other large producer of home laundry equipment is also planning to incorporate a plastic lint filter on models making their appearance this fall.

Of the units covered in this article, two are for use in automatic washers, while the third (used by Maytag) is a filter screen cover or retainer used in the automatic dryers.

### NORGE

A unit cost reduction of 65%, as compared to the previous anodized aluminum filter, was an important factor in Norge's decision to tool a plastic lint filter pan. But other factors entered the picture, too.

Injection molded of one of the Dow Styron high-impact styrene formulations by Modern Plastics Corp., Benton Harbor, Mich., the filter is currently used on all automatic washers in the line except the lowest priced model, mounting on the top of the hollow phenolic agitator. Norge sales and engineering departments prefer the plastic lint filter for its increased strength, improved cleanability, and superior finish. Even the weight of a man standing directly on top of the plastic filter (see photo p. 85) produces no breakage. It can also be dropped on edge on a hard surface, such as asphalt tile, without damage.

Improved appearance is another "plus" value of the plastic filter. Whereas the bright anodized finish of the aluminum filter will eventually wear off in service, the molded-in light blue color of the styrene filter is permanent.

Actual tool costs for the plastic and aluminum filter pans are said to be very nearly comparable; the sizable cost reduction obtained with the styrene filter reflects the elimination of separate fabricating and finishing steps.

In tooling for the new plastic filter, Norge

specified square rather than round openings, thereby reducing tooling time and costs. The holes, of which there are more than 3500, are tapered from top to bottom; this permits lint to be flushed more easily from the filter when it is inverted beneath a faucet. The part is gated at the center, the center sprue and thin web of material being blanked out after removal from the mold. The offsets or bosses for the rubber gasket mounted in the center of the filter require that the piece be rotated in removing it from the mold.

### EASY

By specifying plastic rather than metal for its new Tip Top lint filter, Easy Laundry Appliances Div., Murray Corp. of America, achieved a unit cost saving of about 75%. If the part had been made of die cast aluminum, it would not only have been much more costly, due to the various finishing operations involved, but also considerably heavier, making it difficult to handle with convenience and safety.

Projected from the beginning as a plastic part, the new filter is available on five of Easy's automatic washers—the Golden Regent, Regent, Patrician, Crestmont, and Empress. It is injection molded of Bakelite high-impact styrene TMD-5161 by Plastic Service Corp., La Porte, Ind., using a 48-oz. HPM injection molding machine.

Easy's decision to locate the filter in the lid of the washer for efficient operation presented a difficult molding problem. The part is relatively large (about 15 in. square) and weighs 20 ounces. More than 11,000 small square openings, molded into the center section of the filter, keep all lint out of the circulating water during the wash and "agitated rinse" cycles. However, despite the size and unusual design of the part, it is run without any particular molding problems, thanks largely to the good flow characteristics and minimum shrinkage of the styrene material.

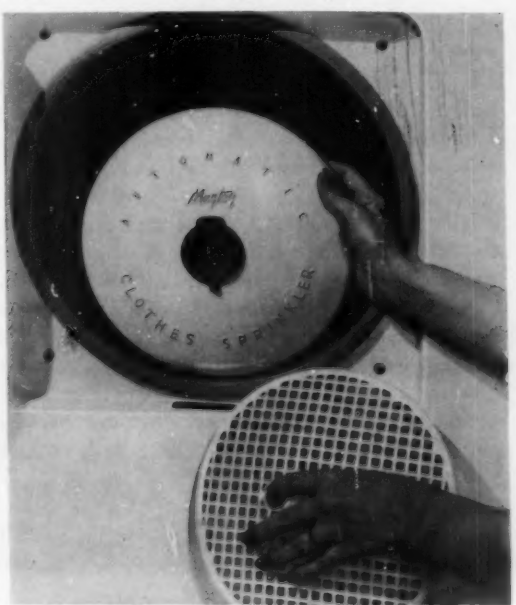
In molding the Easy Tip Top filter, a fan type gate is used to insure even distribution of material. This is cut out after the molding operation, leaving the center of the part open to accommodate the top of the agitator. The spring-loaded "fingers" mount through slots in two corners of the filter, permitting it to be snapped in position in the lid or easily removed for cleaning, are separately molded of the same material on a smaller injection machine and mounted on the filter by solvent cementing. They are pushed toward the center of the filter when it is to be removed from the washer.

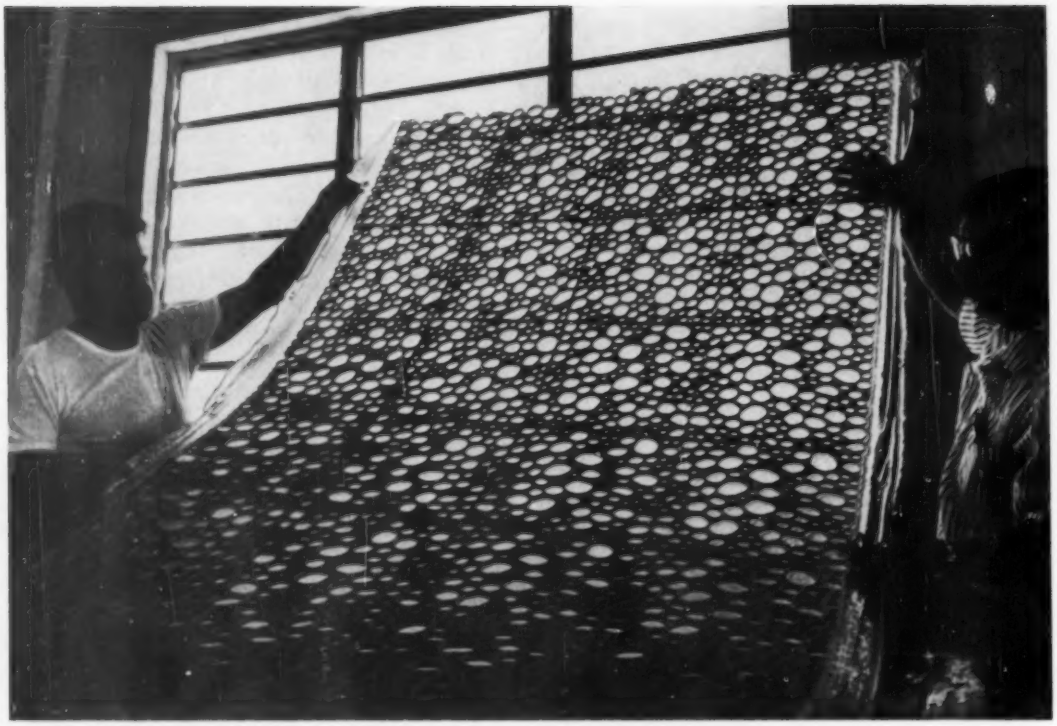
### MAYTAG

In its new line of gas and electric model clothes dryers, The Maytag Co. required a lint screen retainer which would combine production economy, inherent color, rigidity, toughness, and elevated temperature resistance. It was able to find all these properties in a component injection molded (To page 172)

**THUMB AND FINGER HOLES** molded in the retainer make Maytag's Dynamic Disk filter easy to remove for cleaning. Integral color cannot chip or flake off.

**INTERCHANGEABLE** with the PE filter retainer is new automatic clothes sprinkler (top), which is molded of impact styrene. Instructions for use are silk screened on the back of the part.





**TRANSPARENCY OF NEW BUILDING COMPONENT** is demonstrated by this partially assembled panel. To complete assembly, a second reinforced plastics skin is placed on top and the entire assembly put in press for cure. For what it looks like installed, see bottom photo on facing page.

# These fabulous panels . . .

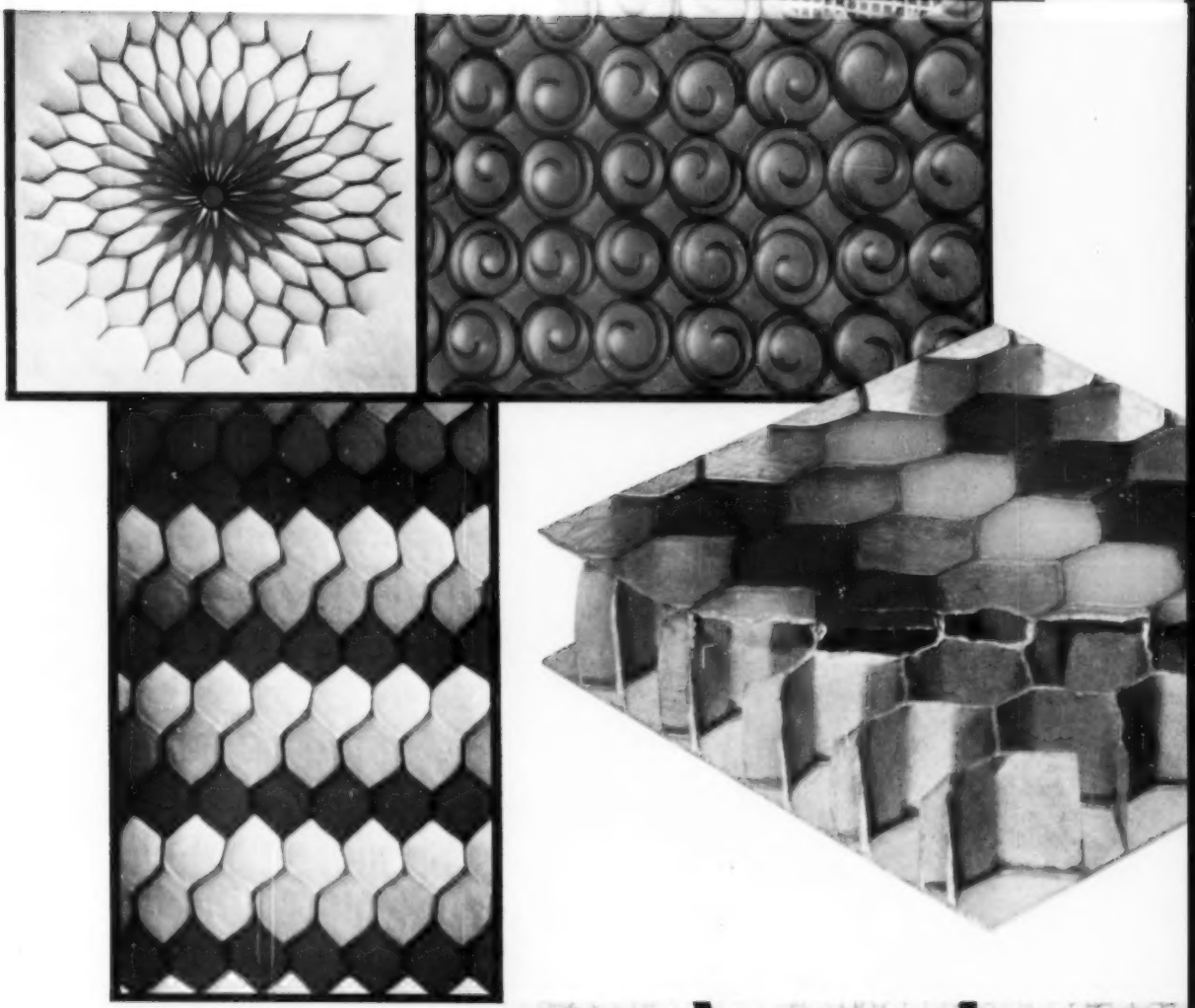
## bring built-in color, beauty, strength, light transmission, economy to modern architecture

The booming building industry, with its billion-dollar appetite for raw materials, has long been eyed by the reinforced plastic molder. But until recently he had been able to reach only the fringe of this big market, producing colorful sheets of flat and corrugated translucent paneling that the do-it-yourselfer assembled into patio roofing and partitioning.

A new type of translucent paneling has now been introduced, aimed at the huge market's heart. Designed specifically for architects and interior decorators, it is usually made to blueprint specifications and installed by professional craftsmen. It teams utility with beauty in a way not matched by any other building material on the market.

An example of the new panel is the Tropicel brand, nationally distributed through architectural supply firms by Naugatuck Chemical Div., U. S. Rubber Co., Naugatuck, Conn. These panels are designed and made by Russell Reinforced Plastics Corp., Lindenhurst, N. Y., using light-stable Vibrin polyester resin especially developed for this application.

Structurally, they are sandwiches with fibrous glass-reinforced polyester skins and a variety of decorated core materials. They are translucent, transmitting roughly half of the



**EXTENSIVE RANGE** of color and pattern is indicated by the four typical designs above. Variations in pattern are achieved by choice of core material. Closeup (above, right) shows construction detail of a panel using a honeycomb core, some of whose cells have been filled in with colored polyester.

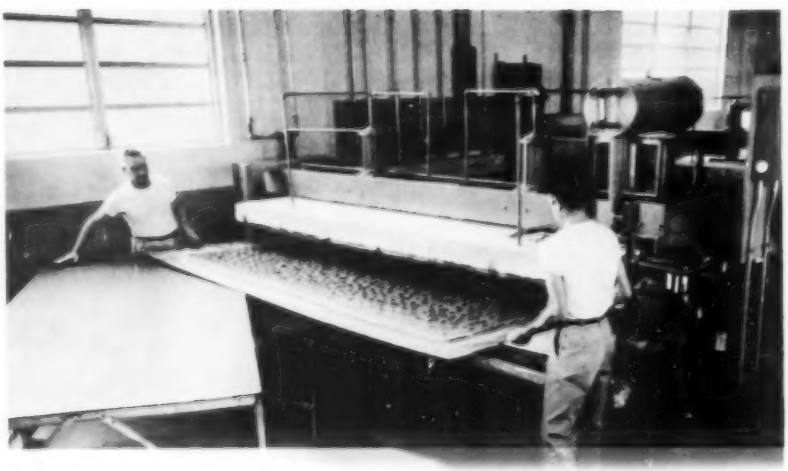
**GLAMOROUS TOUCH** is given to dressing room by dropped ceiling formed of new panels. Light from bank of fluorescent bulbs above ceiling is transformed into soft, well diffused illumination.

## Steps in making a panel

**RUGGED CARDBOARD TUBING** of varying diameter has been bonded into square "log" and is now being sliced into core material by power band saw.

**SQUARES ARE ASSEMBLED** into panel size on table in foreground; other panels in various stages of production are shown on tables in the rear. Curing press shown close up in bottom photograph is located in rear of left aisle.

**FULLY ASSEMBLED PANEL** is placed in press where it will be cured under heat and pressure, or with heat alone.



available light. The different kinds, shapes, and colors of the core material make possible many varieties of color patterns.

The charm of the panel, and its uniqueness, is the way in which it transmits light and colors. Light passing through it is diffused.

From the utility standpoint, the sandwich construction gives the panels a rigidity claimed to be unknown in earlier translucent plastic paneling. The core also creates a dead air space to provide insulation and dampen noise. Finally, the tough skins are shatterproof, noncorroding, and even hurricane-proof.

Ease of installation is another factor. The new panels are installed with glazing and other simple techniques, and the large sheets go up quickly and easily.

**What cores are used**

One of the first core materials tried in the translucent panels was industrial honeycombing. The egg-crate pattern of construction gives an interesting line pattern needed in the panels. It is also available in several cell sizes, and one type of honeycombing expands into a circle. By placing pigmented plastic in the honeycomb cells, random or regular color patterns are achieved.

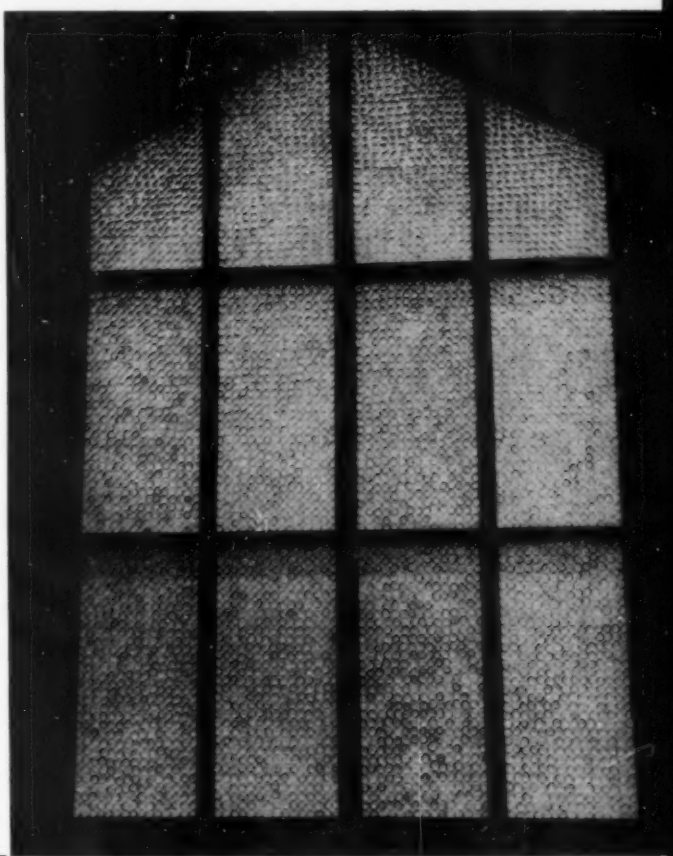
The second core material consists of wood. Five types, from white magnolia to walnut, are now used for coring in Woodcurl Tropicel. In this type of panel color is omitted, and soft hues of the wood provide contrast.

A third type of core material is made from tough treated cardboard tubing. Both black and white tubing are used, and the general effect created is a bubble-like pattern. Color is used in the tubing cells, in a random pattern. A new design also uses bits of colored glass, along with pigmented plastic, to give a "jeweled" appearance.

The panels are built in layers, starting with one plastic skin. The polyester resin used in the skin is then used to bond the core to the plastic facing, and the second plastic skin put in place. The whole assembly is then cured into a single, bonded unit in a flat press using heat and pressure.

Tests to determine the durability of the panels started soon after their development.

As reported by Naugatuck, in the laboratories of the University of Miami groups of panels



**NEW IDEA IN "STAINED GLASS"** windows is this wall in the Second Church of Christ in Syracuse, N.Y., made of the new panel. Pattern is result of using curled wood slices as the core.

**CURLED SLICES OF WOOD,** which will become decorative core for striking building panel, slide off specially designed wood-cutting machine.

were subjected to man-made winds of hurricane force. Then into the fast-moving air stream was injected water, to simulate rain, and bits of debris that might be whipped around during a hurricane. The panels came through without a leak or a crack.

Lengthy exposure to tropical sunlight did cause some color fading. However, this problem is being solved with an acrylic sirup, which is used to laminate panels designed for tough weathering conditions. Polyester panels can be surface-coated with this sirup to improve weathering properties.

While none of the panels is intended for use as load-bearing walls, they are sturdy to withstand hurricane wind loads. The "U" factor, or insulating factor, of a 1-in. thick panel is 0.42, while the coefficient of thermal expansion is ⅛ in. per 100 in. per 100° F.

The panels are made in varying thicknesses up to 1½ in. with wood and tubing cores, and to 4 in. in honeycombing. The largest panel made is 4 by 11 feet.

### Some installations

How are the panels being used? In a Coral Gables, Fla., home, large panels, made with a wood-curl cure, are mounted in aluminum tracks and serve as a colorful sliding screen wall for a lanai.

A small bathroom in Deerfield Beach, Fla., has been given a glamorous appearance with a dropped ceiling of the panels with a tubing core, called Circlet.

A cabana-dressing room at the edge of a swimming pool in Greenwich, Conn., has honeycomb panels mounted on tracks in its dressing room windows.

A curtain wall in a Westbury, N.Y., bank is made from wood-curl panels to illuminate the bank's reception area, and to provide an interesting decorative effect.

In a Boca Raton, Fla., home, three types of the panels have been put to use. Wood-curl paneling is used for the front door. The gable ends of the ranch-type home have been turned into sources of illumination through the use of Circlet panels. On the patio a hexagonal Colorwheel panel, made with a diagonal hole in the center, is fitted around one of the supporting beams for the patio's roof to make a gay, outdoor table. Circlet panels, in the same color scheme, are louvers in a curving wall just behind the table.

The penthouse suite in a new Chicago, Ill., apartment house has room dividers made from honeycomb panels. Wood-curl panels are used to suggest a window, and screen indirect lighting fixtures, in a Rockefeller Center reception room. A modern real estate office in Deerfield Beach, Fla., has honeycomb panels inset in the wall of its two-story high reception area.

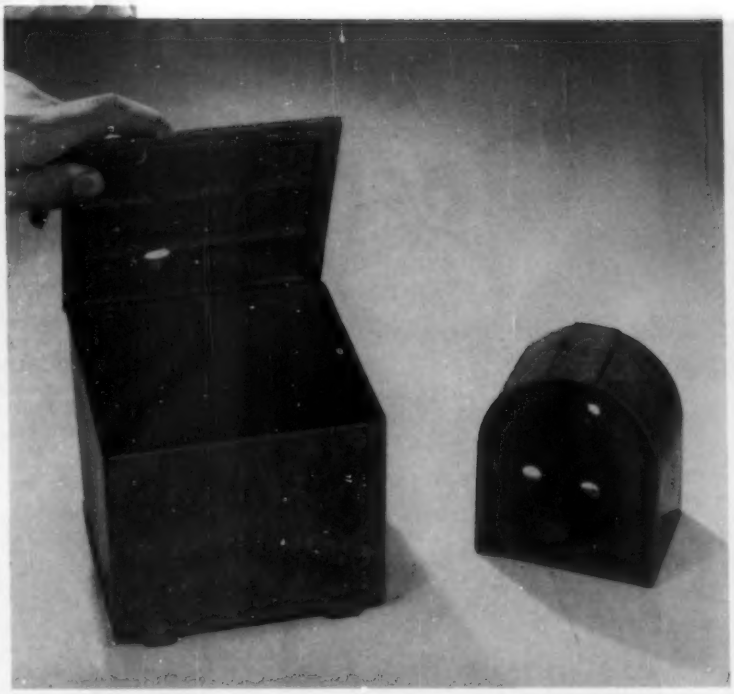
**THE COVER:** Specially designed louver panels combine wood curls with metallic strips that separate color pattern. This is the back view of the wall shown on the full color cover photograph.

### Other applications foreseen

These are some of the uses to which architects and designers have put the new type of panel. Other applications will undoubtedly be developed as the advantages and characteristics of this new architectural material become better known.

Essentially, the panel offers a new and highly decorative solution to the problem of illumination. As a curtain wall it softens and diffuses natural light, while maintaining privacy. As a shielding for artificial light, in a dropped ceiling, it is a new concept in indirect lighting. As partitioning, it divides without blocking off the flow of light. As counter topping, or a table, it can be illuminated from beneath for a glamorous lighting effect.

To all of these applications it also brings color, interesting line patterns and the thoroughly tested durability of reinforced plastics sandwich structure.—**End**



**NEW PAGING UNIT** (above). Corrosion presented a big problem with metal unit, which was overcome by going to premix—at cost savings too. Molded premix parts of new unit are at right. All holes are molded in. Ribs assure better battery fit, are not needed for strength of part.

# Premix licks corrosion, cuts costs, too

***Battery-operated portable paging unit, previously fabricated of metal, is now molded of RP molding compound at savings of 20% in material alone***

A switch from sheet metal to premix for the mounting block, battery box, and cover of a portable paging unit not only solved a bothersome corrosion problem but also resulted in 20% savings in material and 25% savings in assembly cost.

The paging unit consists of three major components: a battery case, lid, a speaker mounting block, and a speaker case.

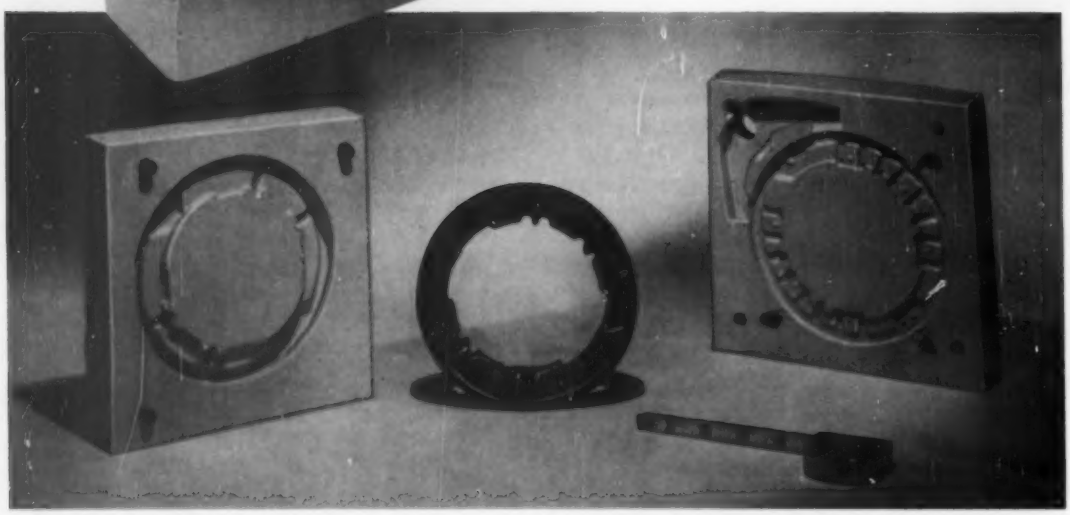
The box and lid were originally fabricated from sheet metal. The box was made in two parts (sides and bottom) with spotwelded flanges. Rivet holes drilled into the case accommodate clips riveted in place. The lid was stamped and drilled. All parts were hand-smoothed, primed, and drilled. The mounting block was a design addition.

The redesigned box and cover had to resist corrosion by the dry cells in the presence of moisture, be leakproof, resist shattering or distortion under rough handling in the field, and hold rivets without elongation of holes or edge crazing. In addition, surfaces had to maintain excellent appearance throughout service life—resist scratches, dents, etc. The unit has the light weight for portability. Cost could not exceed that of the original product; in fact, it should be lower if possible to permit expansion of the market.

The material selected was Thermaflow 1000, a nylon-rag reinforced polyester molding compound that is produced by Atlas Powder Co., Wilmington, Del. The unit is manufactured by Sound-Craft Systems, Morrilton, Ark.; and the molding is done by Squires Plastics, Inc., Verona, Pa.—**End**

# For lower model costs:

← **SAVES 60 PERCENT.** Transistor fixture of epoxy was oven-cured while in silicone mold. Originally machined from nylon, fixture contains 14 milled slots or grooves. The part is now produced at a fraction of the original cost.



**LESS THAN PREVIOUS METHODS.** Epoxy prototype development component for new transformer switch design, shown between two-piece RTV mold in which it was cast. Note risers, gates, and air vents which were incorporated into mold to produce bubble-free compound. Total cost of pattern and mold was $100, significantly lower than previous procedures.

Recently introduced silicone rubbers are bringing sizable savings in many cases where short run models and prototypes are required.

*ITEM:* Coil winding forms used in pairs on a coil winding machine were originally made of hardwood at a cost of $86 per pair. They are now produced from epoxy cast in silicone rubber molds and bonded to wooden bases at a cost of $16 per pair.

*ITEM:* About 60% of the cost of a transistor fixture was saved when the part was cast of epoxy in a silicone rubber mold. Originally the component was machined from nylon.

*ITEM:* Assembly fixture, designed to assemble motor switch components, was originally machined from laminate stock. By going to silicone, $150 was saved for each fixture.

Flexible mold making materials are, of course, not new. Plastisols have been—and continue to be—used for this application for a long time. The new material (at approximately $4/lb., against about 42¢ for plastisols) is not expected to seriously challenge markets where the vinyl compounds have been successfully used. It is anticipated, however, to open a wide vista of new markets where its unusual properties can make important contributions to manufacturing economies.

### What they offer

According to General Electric's Silicone Products Dept., which developed the rubbers and is making them available under the designation RTV (room-temperature-vulcanizing), properties which make the material suitable for model and fixture casting are:

1) Shrinkage is less than 0.2 percent.

2) Built-in parting agent makes mold release material unnecessary.

3) Cure is at room-temperature and, de-

# silicone rubber molds

***Room-temperature curing system makes possible production of epoxy prototypes at a fraction of the price of other methods***

pending on catalyst used, can be varied from 10 min. to 24 hours.

4) The material has heat-resistance up to 600° F., making possible the heat-curing of epoxy resins at elevated temperatures—while they are in the mold.

5) Generally speaking, several dozen models can be cast from a single mold.

**How to make a silicone mold**

Preparation of a mold from a master pattern is a relatively simple operation and involves the following steps:

*1) Preparing master pattern:* The pattern can be of plastic, wood, clay, ceramic, etc. Since RTV will pick up the minutest details, all blemishes must be carefully removed. Waxing and polishing the master results in a high-luster epoxy model.

*2) Preparing the material:* 0.1 to 2% curing agent is mixed with the rubber, depending on requirements. Mixing, though possible in glass, ceramic, or metal containers, is most economically accomplished in disposable paper cups. A tongue depressor or paint stick manually operated is recommended to avoid introduction of air bubbles.

*3) Surface painting:* The entire surface of the pattern should be painted with the silicone-catalyst mixture. If a pattern contains any deep crevices, an air hose carrying 15 to 20 p.s.i. should be used in order to force the material into the depressions.

*4) Pouring the mold:* After a retaining box has been built around the painted patterns, a thin stream of mold material is poured into it. Open-weave-cloth reinforcement can be added to increase tear resistance of mold.

*5) Cure:* Mold can be cured at room temperature. Curing time, however, can be reduced by the application of heat and/or pressure. For example, a mold can be cured at 200° F. in 25 to 50% less time than at room temperature.—**End**

## Making a model

**AFTER MATERIAL** has been mixed and pattern cleaned, compound is brushed onto master. Silicone rubber and catalyst were combined in paper cup shown at extreme left.

**MOLD BOX** is built around painted pattern and mold poured. Though it is room-temperature-curing, material will set faster when heat (either oven or heat lamp) is applied.

**FINISHED** casting is removed from mold. Material has built-in release agent, makes possible production of several dozen prototypes from single mold.

8, 9 in a series

# EVERYBODY NEEDS EPOXIES

**MODERN LEVITT APARTMENT HOUSES,** built from low-cost cinder blocks, are coated by Production Paints & Coatings, Inc. with a special epoxy paint, which seals and protects the surface, and adds decorative color.

## Building—bright future for epoxies

By Frank Pschorr*

The construction industry today consumes an estimated 15% of the plastic industry's total output. This figure has been steadily mounting over the years—and epoxy resins have played a major role in this growth.

These resins offer the heavy building industry a versatile basic material possessing high strength, outstanding adhesion, and good chemical and water resistance.

### Masonry coatings

Cinder and concrete block provide many economical construction advantages, but they have "poor" appearance and do not resist moisture penetration. A one-coat application of new solventless-type paints based on liquid epoxy resins provides decorative color and gloss, as well as an impermeable outer layer. Many commercial and industrial buildings coated with such paints have withstood several years' exposure without adverse effects other than a slight chalking. The lining of concrete swimming pools is still another successful application for epoxy coatings.

On all masonry coatings, epoxy resins extend the basic function of paint. Instead of a mere surface treatment, the epoxy coating provides a thin ceramic-like layer, often replacing expensive brick or tile facing.

### Surfacing compounds

Epoxies have found wide use in the production of both high-friction and smooth floor topping and patching compounds, as well as in the production of road-sealing and surfacing materials. They offer many outstanding advantages in the maintenance, repair, and construction of masonry floors and structures.

The compounds are solvent free, and can be trowelled on in ⅛- to ¼-in. thicknesses, can be feather edged, and will exhibit exceptional adhesion to all types of substrates.

Uncoated concrete has a number of shortcomings—dusting, poor chemical resistance, poor adhesion to itself and other surfaces, poor impact resistance, and wet-slipperiness. The use of epoxy surfacing compounds virtually eliminates these shortcomings. The impact strength of a ¼-in. thick section of the epoxy

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masonry surfacing compound is equal to a 2-in. thick section of concrete; its tensile strength is over four times that of concrete and its compressive strengths twice as high. Epoxy surfacing and patching compounds can be pigmented to a wide range of colors, thus imparting decorative and functional properties, without an additional painting operation.

For applications where high-friction properties are of prime importance, and impact- and chemical-resistance properties secondary, the topping can be applied less than ⅛ in. thick. A simple method of installing such high-friction toppings is to apply a high build coating formulated with epoxy resins using brush, roller, or rubber screeds and then spreading sand or other grit over the surface before curing takes place.

Economical, decorative epoxy flooring compounds incorporating colored marble chips are the latest development in the field of floor surfacing. Offering many of the proven advantages of epoxy surfacing compounds, epoxy-marble chip (terrazzo) flooring provides a wide range of colors and patterns, combined with lightweight and time-saving installation.

**Lining for pipe**

The use of liquid epoxy resins, properly formulated and applied, provides a method of lining concrete sewer pipes. The epoxy linings are economical enough to be applied to the entire interior; they are highly resistant to most sanitary and industrial wastes; they prevent water seepage or penetration of sewage gases; they resist high hydrostatic pressure with no blistering, cracking, or loss of adhesion; and they are resistant to bacterial and fungicidal attack. These properties are particularly important in municipal sewage systems and in waste lines in chemical and food plants.

Pipe may be epoxy-coated in two ways—by knifing the epoxy-hardener blend or by spraying. In the knifing method, individual pipes are placed on rollers, the ends are blocked off at the circumference, a measured amount of resin-hardener mix is introduced and a knifing device spreads the coating while the pipe turns on the rollers. Film thickness may be up to 30 mils. Epoxy reinforced fibrous glass pipe is another type that has met with considerable success. The oil industry has used it successfully for several years to carry salt water. Because of the excellent chemical resistance and low creep properties, epoxy pipe's higher initial cost can be justified by long term maintenance-free use. Fibrous glass pipes in 2 to 3-in. diameters that can withstand pressures up to several thousand p.s.i. are available.

**Patching and repair**

Properly formulated epoxy compounds, as masonry welding cements, are being used on a wide scale today for permanent repair, and restoration of old concrete, as well as for application in new construction.

These welding cements have been used to fill and seal large cracks and voids and deep cleav-

**MANY YEARS OF SERVICE LIFE** are provided by epoxy patching compounds supplied by Permagile Corp. of America to repair cracks in Kansas City, Kansas grain elevators. Conventional cement and concrete mortars were unsuccessful in halting disintegration of poured reinforced concrete.

ages. Even hairline cracks may be sealed without opening them, by use of an unfilled liquid epoxy compound. The cements have been used for joining of pre-cast concrete slabs of all shapes, for joining of the tile where the grouts must be absolutely waterproof and resistant to vibration and chemical attack, and for setting overhead and vertical tile without the use of temporary supports. Epoxy cements are used to join and repair clay pipe, terra cotta, etc. for restoring stone, brick and concrete architectural detail. They may even be used to join glass and glass brick, wood, plastics, and metals to concrete and other masonry.

Another interesting job taken on by epoxies is in the repair of decorative marble slabs. Cracks often develop while the marble is being cut, machined, or polished at the marble works. Epoxy resins have been successfully used to replace the conventional repair cement, brownstick shellac. The epoxy cement is "cold-cured" and repairs that must be made are almost completely invisible.

Plastic foam and reinforced panels for building constructions represent the largest uses of plastics by the construction industry, excluding paint. Epoxy resins are an ideal adhesive for most of the foam materials and yield strong bonds to a wide variety of materials; and the wide range of curing conditions and formulating flexibility available with epoxies permits them to be tailored to almost every conceivable panel and foam requirement.

**Conclusion**

As epoxy resins move into more and more construction material markets, new techniques, formulations, and products are being developed to fit specific uses. Recently developed spraying equipment, for instance, allows rapid lay-up of fibrous glass laminates as well as application of masonry coatings. Equipment for coating pipe interiors and new couplings and fixtures are producing improved results in the conduit field; new resins and additives are pointing the way to better high temperature and weather resistance properties. It is believed that further growth of epoxies in the heavy construction areas will depend to a great extent on development along these lines.

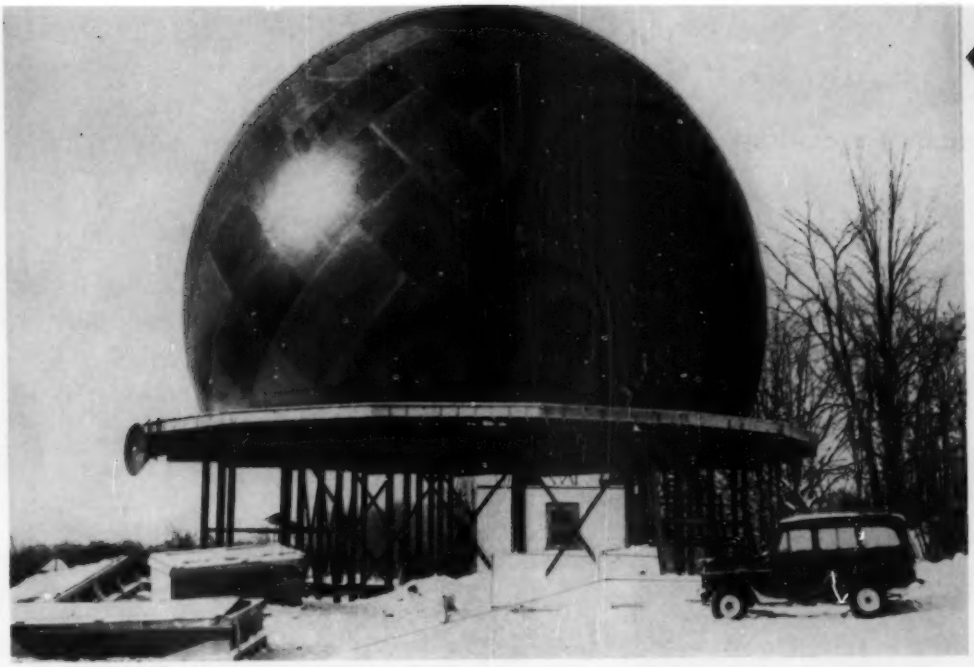
Perhaps even more important than these technical developments are the educational sales efforts put forth by basic resin producers and formulators—efforts aimed at convincing and demonstrating to engineers, architects, building code officials, government groups, and contractors the proper use of these resins and the genuine economies possible.—End

## Epoxies replace tiles as roofing material

**A** promenade deck coating (left), based on Bakelite epoxy resins and formulated by Twinsburg-Miller Corp., provides the answer to a need for a footing material that offers better resistance to roof traffic and building movement without suffering surface rupture.

The coating is applied directly to the structural slab over a layer of mastic and woven glass, without the pre-waterproofing that is normally required. With conventional tile, the structural surface must have a cement coat applied over a waterproofing membrane. The tile is then embedded in the cement coat.

In this epoxy system, a neoprene mastic is used in combination with woven glass as an underlayment for the promenade surface. This primer coat separates the epoxy surface from the structural slab, and minimizes ruptures if severe building movement occurs. It also provides the epoxy surface with a cushion.—End



**ASSEMBLY OF RADOME** 40 ft. high, with a base diameter of 50 ft., was completed by six men in only one and a half days. Loads in unsupported sphere are uniformly distributed throughout the structure.

# Epoxy panels— less weight, more strength

Current trends in building place heavy emphasis on lightweight pre-fabricated panels. Reinforced plastics are strong contenders for this important market, and epoxies are competing with other resins for their share in these applications. In addition to building uses for both temporary and permanent structures, epoxy panels are currently being investigated for truck trailers and rolling stock.

A giant radome, which was designed and built by a Canadian company, gives an indication of the complex structures that can be made with epoxy panels. The critical requirements for this application probably far exceed the design and engineering problems of more conventional structures, but provide a measurement of the type of specifications that can be met by these resins.

The radome is designed to withstand winds of 150 m.p.h. and extremely low temperature. It stands 40 ft. high, weighs 9000 lb., has a

**INTERLOCKING** panels are mated through tongue-in-groove joints, held in contact with cam - actuated locks. Structure in center (also visible in photo below) is radar antenna.

**STRUCTURE** shown here from the inside consists of 156 panels. Only 1500 locks are required in this design, compared with 4500 locks used for geodesic radomes.

## How panels are made

**OUTER FACING** of glass cloth impregnated with epoxy resin is applied over impregnated honeycomb core, which is bonded to a set of edge channels with an epoxy adhesive. After the entire assembly has been allowed to cure, panel is removed from the frame and trimmed.

**EDGE CHANNELS** are produced in matched steel, electrically heated mold. Epoxy impregnated glass mat (foreground) is in female half of mold.

**LIGHTWEIGHT PANELS** being stacked in the plant. Front edges of panels show grooved side with recessed locks bonded in place.

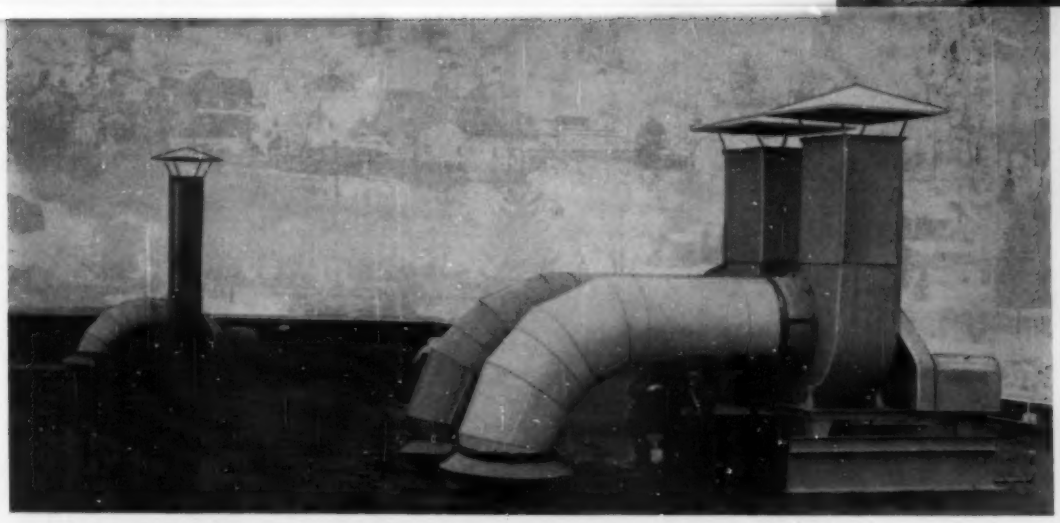
50-ft. base diameter and 55-ft. equatorial diameter. The structure consists of 156 individual panels, the largest near the equator weighing 100 lb. and measuring 6 by 12 ft., and the smallest near the pole being 3 by 4 feet.

Each panel is made of Shell Chemical Corp.'s Epon 828 resin, reinforced with two plies of glass cloth. A 1-in. paper honeycomb core is then bonded between the two skins. A sheet of Dynel fabric—an acrylic-based fiber—on the outer surface of each panel provides improved weather resistance.

Long Sault Woodcraft Ltd., St. Andrews East, Quebec, Canada—who designed and built the radome—chose epoxy resins for this application because of their superior mechanical properties, high interlaminar strength, and good fatigue and stretch characteristics. Because of relatively low water absorption in an epoxy laminate, the normal deterioration from the contraction caused by freezing and thawing is greatly reduced.

Epoxy resins were also used in tooling for the radome. All of the skin molds and the assembly jig tables were built as epoxy laminates. The molds and jigs were also of a sandwich construction. From a structural point of view, the design of the radome is that of a shell in which loads are carried uniformly throughout the structure.

The light weight and the dimensions of the panels make it possible to ship an entire radome in a single C-119 or C-124 aircraft. Six men can erect a radome in a day and a half. The panels are attached by 1500 cam-actuated locks. Standard RFP radomes use up to 4500 nuts and bolts to join the panel flanges.—End



**ROOF OF ZIPPO PLANT,** showing exhaust end of three venting systems fabricated from rigid vinyl.

# PVC ducts save

***By replacing steel with polyvinyl chloride for venting ducts, manufacturer eliminates all maintenance problems, increases service life five-fold***

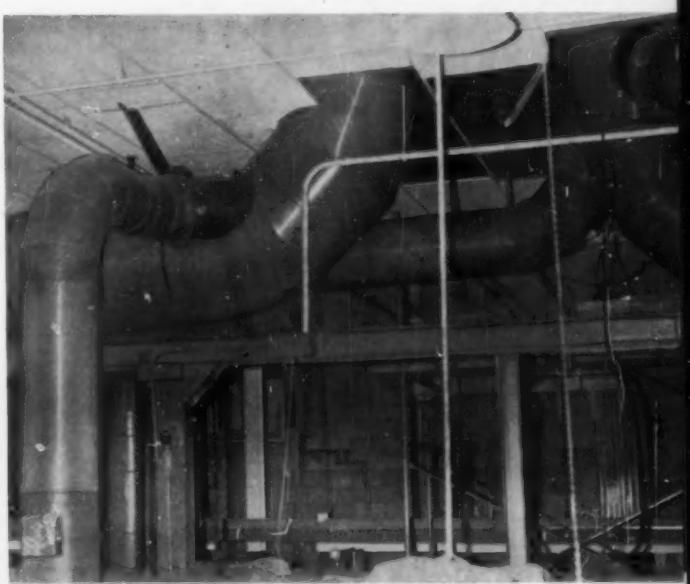
Spending three times as much for a polyvinyl chloride ducting system than for a steel unit it replaces, yet save half the cost, is a neat trick. But that's just what Zippo Mfg. Co., Bradford, Pa., accomplished at its cigarette lighter plant.

The company uses chromic, sulfuric, and hydrofluoric acid extensively in the final processing of these lighters. Metal duct work to vent the corrosive acid fumes was installed in 1955 and heavily coated with corrosion-resistant paint; yet about 3½ years later the metal ducting failed.

In replacing the system, Zippo turned to unplasticized Type I PVC sheet. Cost of the PVC system came to three times the cost of the old steel one. But—

- Maintenance was eliminated: The metal ducts had to be painted and patched twice a year. The new duct work requires no painting or patching at any time.
- Life expectancy of the PVC ducts is estimated at five times the steel work.

The ducts range from 11 to 29 in. in diameter and are fabricated (cut, formed, and welded) by Cleveland's Metal Works, Bradford, of ⅛- and $\frac{3}{16}$-in. PVC sheet stock. Over 1500 lb. of sheet, supplied by A. M. Byers Co., Pittsburgh, Pa., went into the installation.—End



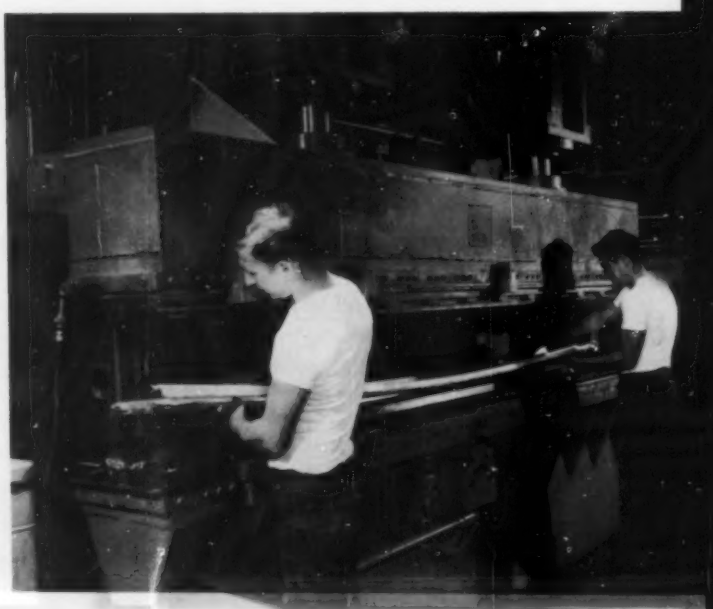
**MASSIVE PROPORTIONS** of PVC ducting system are revealed in inside view of cigarette lighter factory. Note complex configurations into which engineers designed the "pipe."

**UNDERSIDE OF JET FLOOR SECTION** about to be installed, showing epoxy glass structural spacers. About a mile of these spacers is used per jet for necessary passenger comfort.

# INGENIOUS INSULATION

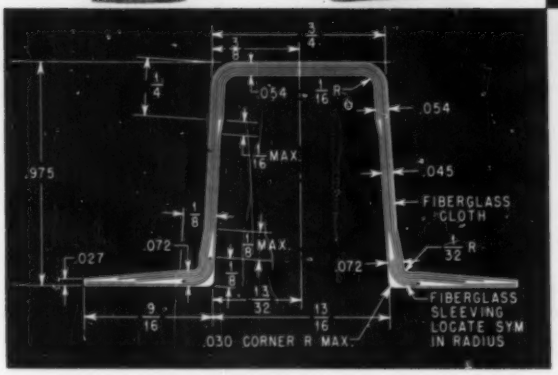
***A mile of reinforced plastics structural members per plane brings important savings in heat costs, provides 50% more fatigue resistance than equivalent aluminum sections***

**GLASS CLOTH SLEEVE** is sewn into corner of preformed section. By sewing the sleeve directly onto laminate layers, molder makes sure that the reinforcement stays where it is needed.



**PREFORMED LAMINATE** layers are assembled and laid into forming dies on 170-ton press.

**CLOSE-UP** of preform die. Preimpregnated glass cloth has been cut to required width and will be partly formed at this step.




**BLUEPRINT DRAWING** of a section of flooring member, showing all dimensional specifications. Note how number of reinforcing layers varies throughout. Close-up of actual part is shown in upper left hand corner.

# FOR JETS

Imaginatively designed structural members of glass-reinforced plastics are providing the answer to the critical floor insulating problems of today's high-flying jets.

When a pilot takes a jet airliner up to cruising altitude, he is in effect putting the plane into a giant deep freeze. Temperatures outside drop far below zero, and the floor, composed of aluminum sheeting and directly connected through structural members with the aircraft exterior, acts like a huge heat-sink stretching from one end of the cabin area to the other, creating cold drafts across passengers' ankles, and putting a heavy load on the heating system throughout the cabin.

Douglas Aircraft has solved this problem in the design of its new DC-8, which enters commercial service this month (September), by developing a double-floor construction using hat-shaped reinforced plastics spacers as structural members. Measurements made by the company on the assembled floor indicate that the new type of construction has twice the insulating value of an all-aluminum floor of similar design. In dollars and cents this means important savings in heating costs over the lifetime of the plane.

Just as important, the RP spacers have proved to have 50% more fatigue resistance than aluminum sections of equal strength. Douglas engineers have been able to specify RP for the floor with no weight penalty. In fact, by careful redesign of the hat-shaped sections, they have been able to shave 100 lb. off the total weight of the plastic spacers, thereby increasing the all-important payload of the aircraft by an equivalent amount.

### Effective on the ground, too

The success of the Douglas floor has already led to wide-spread interest in other insulation applications. For example, Townsend Engineered Products, Inc., Santa Ana, Calif., has designed a new type of lightweight trailer to contain electronic control equipment for missiles in the field, whose double walls are separated by the same type spacers.

The basic spacer design is that of a broad-brimmed hat, 1 in. high, ¾ in. across, with ½-in. flanges. The latter provide a broad bonding surface, converting the open channel into a structural box that stiffens the floor panel at the same time that it acts as an insulating spacer;

(To page 180)

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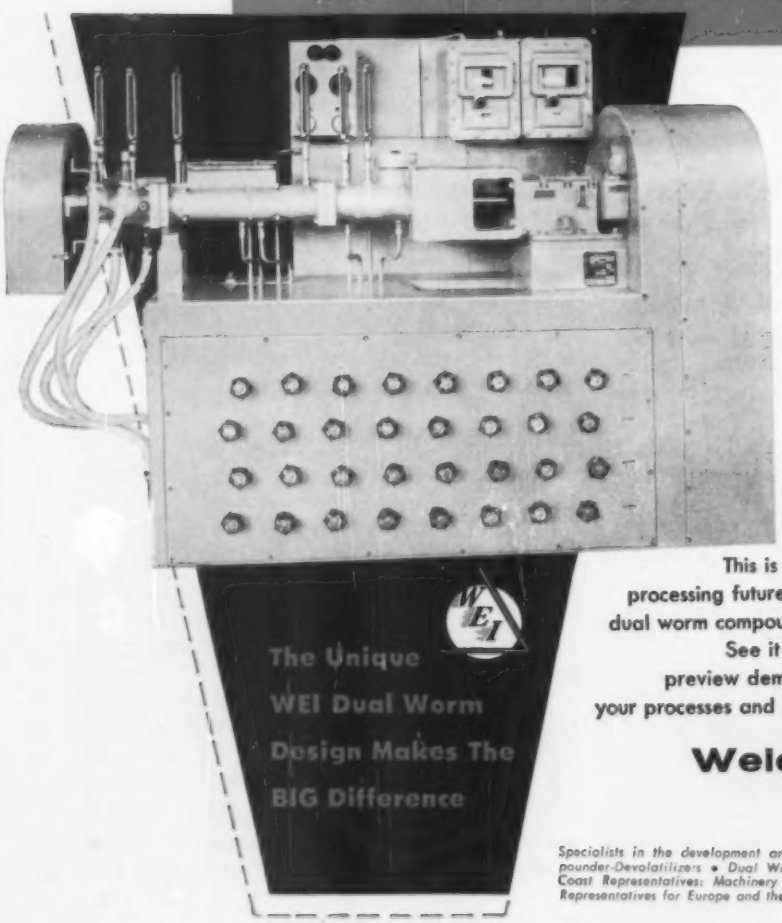


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# Injection molding:

## a rheological interpretation— Part I

By R. L. Ballman† and H. L. Toor‡

The basic problem of injection molding, the filling of a cold cavity with a hot non-Newtonian fluid, has been studied. Evidence is presented to show that the gross flow process depends upon the rheological properties as measured in an isothermal, steady-state, rheometer.

The mean fluid velocity has been found to decrease exponentially with time as the fluid moves into a cavity of constant cross-section under a constant applied pressure. This time dependence holds for polystyrene over wide ranges of conditions, as well as for polyethylene and appears to be the characteristic equation for flow into a cavity when the fluid is freezing as the flow progresses. The velocity falls much more rapidly, and the time dependence is considerably different, from what would be expected for isothermal flow. These differences are attributed to the heat transfer in the cavity.

This article introduces the reader to the subject and discusses preliminary experiments, theory, and the experimental problem. Part 2 will discuss equipment, experimental procedures, and results.

Like many other activities, injection molding can be carried out successfully with very little quantitative understanding of the process. However, in the desire to improve the operation and expand its scope, the necessity for a more complete and fundamental understanding has become apparent.

The work of Spencer and Gilmore (4)[1] sketched out many of the broad relationships among the varied phenomena which occur in the process, but of necessity, ignored the details of some of the basic mechanisms. To predict the effect of changing variables, such as temperature or pressure, or to be able to predict whether a polymer with particular rheological and thermal properties can be successfully molded in a particular die and press, demands a much deeper understanding of the process than is presently available. Thus, this research program, the initial stages of which are reported here, is aimed at gaining an understanding of the basic mechanisms in terms of the fundamental rheological and thermal properties of the polymers.

Although injection molding seems simple, the details are quite complex, and in many cases little understood. A review of previous studies of separate parts of the process is available (2).

Possibly the most complex and important phase of the process is the flow into the mold. Spencer and Gilmore (4) attempted to predict the time to fill a mold by adding empirical correction factors to the isothermal flow equation. If the heat transfer is small this approach may have some utility, but in the common case where the heat transfer is the predominant mechanism which controls the flow, this approach offers little towards an understanding of the process. For example, if one desires to determine the conditions which will just fill a die, it is clear that the effect of cooling in the die cannot be neglected, for at this limit the major phenomena controlling the flow are the cooling and subsequent freezing.

Thus, it was felt that the long-term objective of this research program could not be attained without first facing the central and least understood problem of the molding process—the flow of a hot polymer into a cold mold.

This problem is complicated by a number of factors—the first being that it is not even clear that steady-state (i.e., constant-velocity) rheological properties as measured in, say, a capillary rheometer, are applicable to the unsteady flow in a die.

Two experimental methods of studying the flow were considered. One was to construct a non-isothermal, unsteady-state rheometer which simulates the molding machine and the other was to use an actual injection molding machine in the study.

Analysis of the first alternative showed that the desired rheometer would be, in essence, an injection

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[1] Numbers in parentheses link to references at end of article, p. 192.

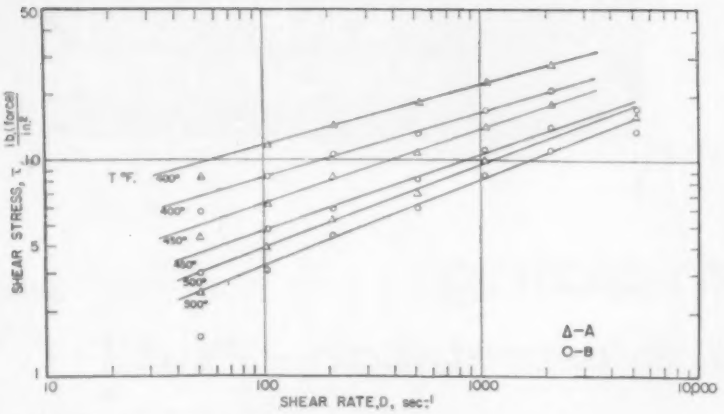



**FIG. 1:** Shear rates of two polystyrene formulations.

molding machine and consequently it was decided to use a commercial machine with a specially constructed mold of simple geometry for the flow study. A further advantage to this approach is that the combination of the results of the flow study with the other factors in the injection molding process is automatically carried out.

Consequently, the viewpoint of this study is that the mold is a non-isothermal rheometer and that the flow in a particular mold will be completely defined once the inlet melt pressure and temperature and the mold temperature are specified. Thus, the injection molding problem is resolved into the following:

1) The basic problem of unsteady, non-isothermal flow.

2) The interaction between a mold and a hydraulic ram which is clearly reflected in the effect which the two systems have on the inlet conditions.

### Preliminary experiments

A preliminary experiment was carried out to determine whether it is possible, at least in principle, to describe the flow in terms of the steady-state rheological properties of the polymer. That is, if the relationship between local shear stress and rate of strain measured in an isothermal, steady-state, capillary rheometer is expressed as

$$\frac{du}{dr} = f(T, \tau) \qquad \text{Eq. 1}$$

then does this equation hold at every point in unsteady, non-isothermal flow in a mold where the mean and local velocity vary strongly with time and the local temperature varies with time and position? This would only be true if relaxation effects were negligible, that is, if the time necessary for the polymer to readjust to time-varying conditions is much less than the time scale of the experiment. (We are assuming that the flow is always laminar, since the highest Reynolds numbers obtained with these very viscous fluids are far below the critical value of 2100 for turbulence.) Actually, if the modes of flow in the rheometer and molding machine differ the following experiment should indicate it. To answer the question the following experiment was carried out:

Two commercial polystyrene molding compounds, Compounds *A* and *B*, were adjusted so that the external lubricant on each was the same, in order to equalize solid zone frictional effects, and then they were run in a steady-state, isothermal, capillary rheometer at a series of different temperatures and shear rates with the results shown in Fig. 1, above, and Fig. 2, p. 107. It can be seen that over the full range of experiment, the increase in temperature required to give Material *A* the same apparent viscosity as Material *B* varies only from 28 to 34° C. These values are shown in Fig. 2. Thus, if the rheological measurements are of significance to injection molding, then the same shift of the temperature scale in molding should cause these materials to behave in a like fashion.

In molding, if ram pressure and

### Definition of terms used in article

A=rheological parameter, (1/sec.) (in.²/lb.)ⁿ
A°=constant, (1/sec.) (in.²/lb.)ⁿ
$A_x$=cross sectional area, in.²
b—constant, °F.
B=reciprocal fractional rate of decrease of velocity, sec.
d=channel diameter or thickness, in.
D=mean shear rate, 1/sec.
f=functional symbol
I=mean value of A across conduit, (1/sec.) (in.²/lb.)ⁿ
I=mean value of I along conduit, (1/sec.) (in.²/lb.)ⁿ
K, K'=dimensionless constants
m=function of n
n=rheological parameter
p=number of channels preceding cavity
P=pressure, lb./in.²
$P_r$=pressure applied to molten polymer, lb./in.²
r=radial distance coordinate, in.
R=flow resistance per unit length, (lb./in.²) (sec./in.$^{n+1}$)$^{1/n}$
$R_T$=total flow resistance, (lb./in.²) (sec./in.$^{n+1}$)$^{1/n}$
RFT=ram forward time, sec.
s=area ratio
S=shear stress at wall, lb./in.²
T=temperature, °F.
$T^o$=base temperature, °F.
$T_c$=cylinder temperature, °F.
$T_D$=die temperature, °F.
u=point velocity, in./sec.
V=mean velocity, in./sec. or cm./sec.
x=axial distance coordinate, in.
x'=reduced axial distance, x/X
X=length of cavity filled at any time, in. or cm.
$X_f$=fill-out, in. or cm.
Z=reduced radial distance, 2r/d
θ=time, sec. or RFT when wave front enters cavity
θ'=time to approach 99% of fill out, sec.
$\mu_a$=apparent viscosity, (lb.sec./in.²)
τ=shear stress, lb./in.²
subscripts
o=entrance to cavity or at instant polymer enters cavity
L=filled cavity
1=channel preceding cavity or first cavity
i=channel index

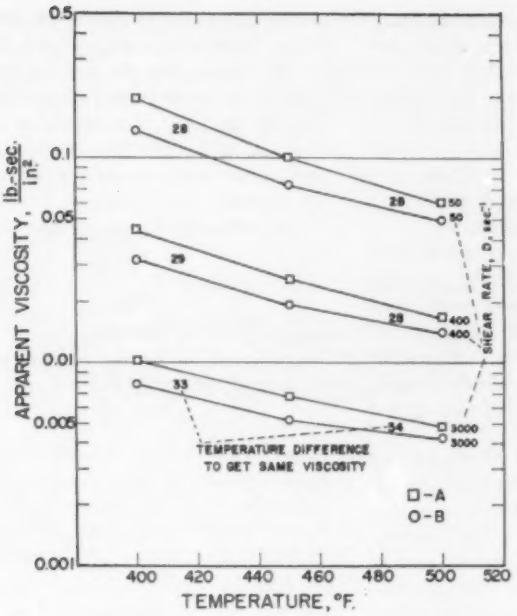



**FIG. 2:** Apparent viscosity versus temperature for two polystyrene compounds.

melt temperature are low enough the polymer cannot fill the die, and it will freeze at some point inside the cavity. This length of flow, which we call "fill-out," will depend strongly upon all the factors controlling flow and heat transfer and, consequently, it is a very convenient measure of the gross behavior of the polymer in unsteady, non-isothermal flow. Since the mean polymer velocity in the die varies from a large initial value to zero, and the temperature varies from the hot cylinder temperature to the cold die temperature, the fill-out measures the integrated effect of the rheological properties over wide ranges of shear stress and a wide range of temperatures.

The mold cavity was 0.075 in. thick, 1.00 in. wide, and 12 in. long (see Fig. 3, right). It was connected by a narrow channel to the nozzle of a 3-oz. machine. The apparatus and experimental details are described later.

Figure 4, p. 108, shows the fill-out for Compound *B*, (length of bar in cm.) as a function of cylinder temperature for two different ram pressures. Each point is the average of 30 shots and they are reproducible to about 5 percent. The die temperature was varied with cylinder temperature to keep a constant 300° F. difference between the two temperatures at the high pressure and a 400° F. difference at the low pressure. Material *A* was run with the same differences between the cylinder and die temperatures and since both materials have essentially the same thermal properties, the heat transfer should be identical in both cases if the flow is identical, since the reduced temperature parameters are similar. Points for Material *A* at the low pressure and at the high pressure are shown and it is seen that at the low pressure Material *A* gives the same fill-out as *B* when its temperature is 33° F. higher than *B's* and at the high pressure the increase necessary is 30° F.

These differences are substantially the same as those found in the rheometer, indicating that the entire injection molding process does depend largely upon the rheological relationship obtained in the rheometer, and that relaxation and other effects, if not negligible, at least vary in the same manner for both materials. Although the subject will not be pursued in this paper, the results also indicate that two materials with similar thermal properties and with rheological properties that differ in the same fashion as above (rheologically similar), will "mold" the same way, whatever the measure of "molding" may be, if the temperature scale were shifted so as to make the rheological properties the same.

## Theory

The above results allow a preliminary analysis of the flow problem. The steady-state rheological relationship between stress and rate of strain for the polymers under consideration can be correlated with sufficient accuracy by

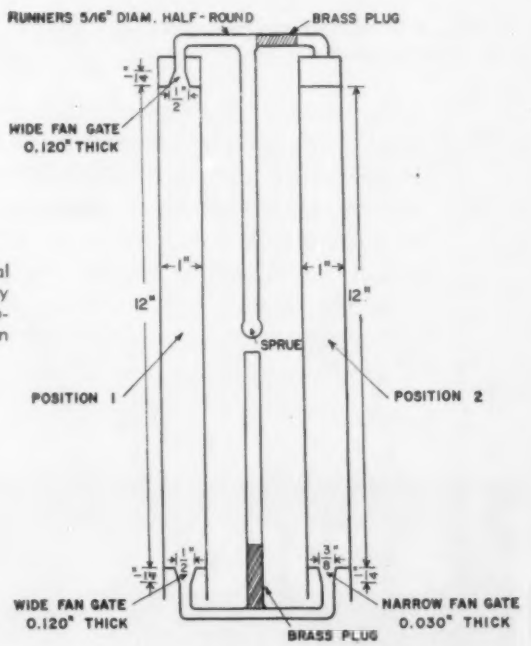



**FIG. 3:** Experimental die set-up used to study the rheology of thermoplastics in the injection molding process.

a simple power law. For unidirectional flow then,

$$\frac{du}{dr} = -A(T)\,\tau^n \qquad \text{Eq. 2}$$

where the temperature dependent term A(T) has the form

$$A(T) = A^\circ \exp\left(-\frac{b}{T - T^\circ}\right) \qquad \text{Eq. 3}$$

The previous work implies that these equations hold at every point in a non-isothermal die as well as they do in the cylinder of the press.

A force balance for flow in a tube or between two wide, parallel, flat plates yields

$$\tau = K'r\left(-\frac{dP}{dx}\right) \qquad \text{Eq. 4}$$

where the constant $K'$ depends upon geometry. This balance assumes that inertia effects are negligible—a safe assumption considering the very viscous materials under consideration. For unidirectional flow dP/dx is constant *across* the channel.

If Eqs. 2 and 4 are combined, integrated twice across either a tube or a channel consisting of wide parallel flat plates, and then integrated by parts,

$$V = Kd^{n+1} I\left(-\frac{dP}{dx}\right)^n \qquad \text{Eq. 5}$$

$$I = (m+1)\int_0^1 Z^m A(Z)\,dZ \qquad \text{Eq. 6}$$

where $Z$ is the reduced variable $2r/d$ and $m$ has the value $(n+1)$ for flat plates and $(n+2)$ for a tube. $K$ is a constant, again depending upon geometry, and $I$ is the mean value across the stream of the rheological constant $A$. This mean depends upon the temperature profile in the plane perpendicular to $x$ since $A$ is strongly temperature dependent.

Consider a non-isothermal channel partly filled with polymer at a time $\theta$. Let $x$ measure distance along the channel as in Fig. 5, p. 111. The polymer is moving through the channel and its temperature varies along and across the channel.

Since the velocity profiles along the channel must also be changing as the flow front moves into the channel, there are radial velocity components at all points, and it must be assumed for the application of the above equations that the effect of these components is small. At the flow front itself, the radial velocity must be large in order for the polymer to fill the empty channel, so the equations would be expected to apply only when the flow front volume is a small part of the total already-filled volume of the cavity. In narrow channels this restriction is minor. If the polymer is incompressible (a reasonable approximation), the mean velocity $V$ must be the same for all $x$ at any time; so from Eq. 5 at any instant,

$$-\int_{P_o}^{0} dP = \left(\frac{V}{Kd^{n+1}}\right)^{\frac{1}{n}} \int_0^X \frac{dx}{|I(x)|^{\frac{1}{n}}} \qquad \text{Eq. 7}$$

where $P_o$ is the pressure at the cavity inlet at the time $\theta$ and $X$ is the distance from the cavity inlet to the wave front (where the pressure is zero). $I$ is taken as a function of $x$ since the temperature of the polymer varies along the channel.

Integrating and solving for $V$,

$$V = K\,\bar{I}\,d^{n+1}\left(\frac{P_o}{X}\right)^n \qquad \text{Eq. 8}$$

where

$$\bar{I} = \left[\int_0^1 \frac{dx'}{|I(x')|^{\frac{1}{n}}}\right]^n \qquad \text{Eq. 9}$$

$x'$ is $x/X$ and $\bar{I}$ is the effective mean value of the rheological parameter $A$ across and along the channel at any time $\theta$ as defined by Eq. 7. The term $\bar{I}$ is clearly a function of time.

If the flow is isothermal, $\bar{I}$ reduces to $A$ and Eq. 8 takes on the standard form

$$V = KAd^{n+1}\left(\frac{P_o}{X}\right)^n \qquad \text{Eq. 10}$$

Although Eqs. 8 and 10 have the same form, the evaluation of $\bar{I}$ for non-isothermal flow is a complex heat transfer problem since the conduction equations are strongly coupled with the velocity profiles through the parameter $A$, and $A$ normally varies over several orders of magnitude during the flow. It will be shown later that the variation of velocity as the flow front moves into a channel is controlled largely by the change of I rather than by changes of $P_o$ or $X$, especially for long times.

Equation 8 can be put in the following form

$$V = \left(\frac{P_o}{XR(\theta)}\right)^n \qquad \text{Eq. 11}$$

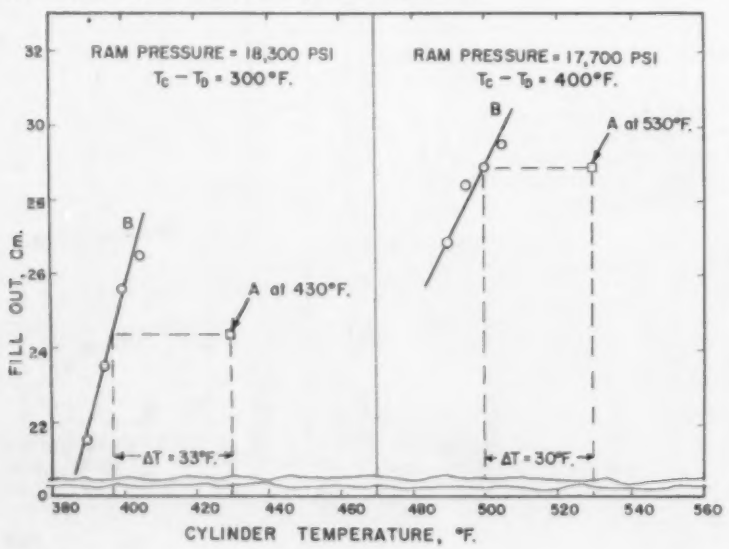
where

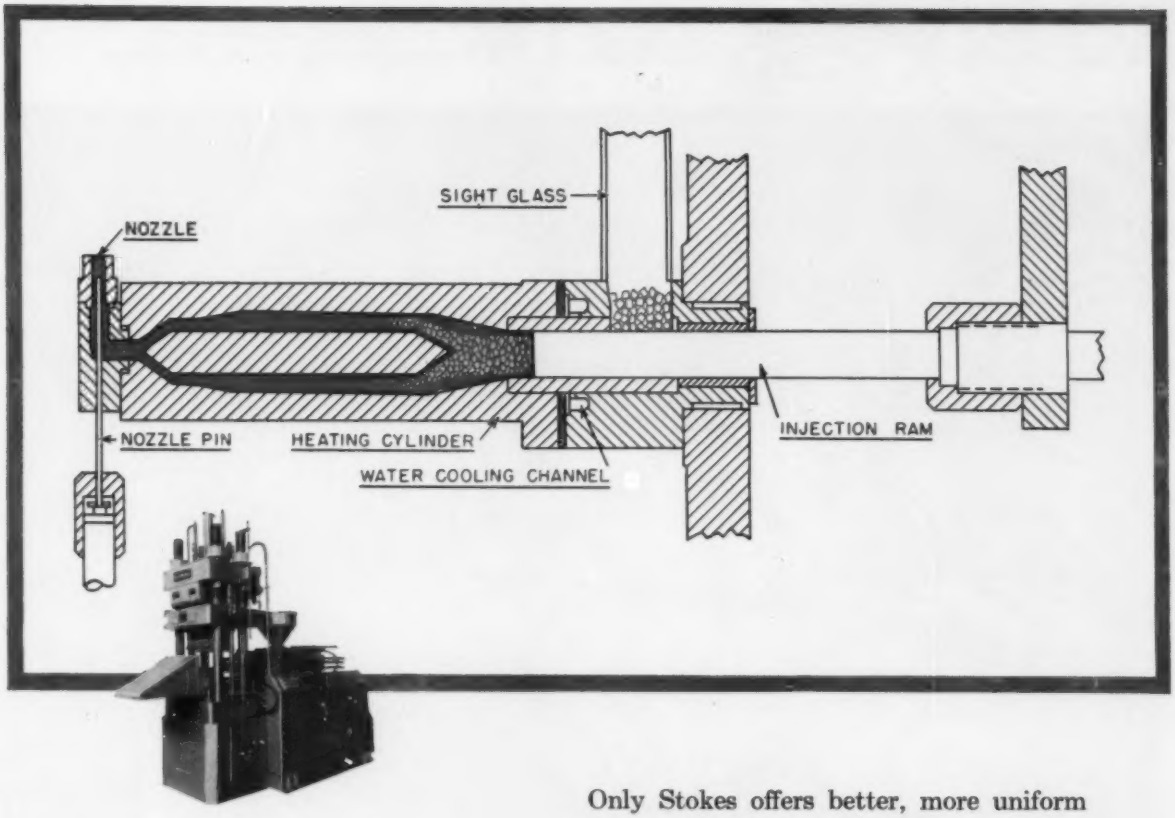
$$R(\theta) = (K\bar{I}(\theta)\,d^{n+1})^{\frac{1}{n}} \qquad \text{Eq. 12}$$

$R(\theta)$ can be considered to be the resistance to flow per unit length of filled channel. For an isothermal channel the resistance is constant, but for non-isothermal flow it should increase with time, reflecting the effect of the polymer temperature decrease.

Eq. 11 shows that, if pressure at cavity inlet is finite, the velocity is infinite when length of fill is zero. Since no **(To page 111)**

**FIG. 4:** Fill-out as a function of cylinder temperature.



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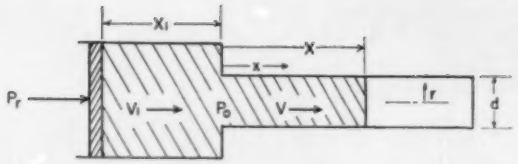



**FIG. 5:** Two channel model. Symbols are defined in the text.

reservoir can deliver material at an infinite rate, $P_o$ must start out at zero and rise to its final value, and the manner in which it varies must depend upon the system which is delivering fluid to the cavity. Thus, the filling of an initially empty cavity cannot be treated in isolation but must be considered in terms of its interaction with the delivery system. (Since there will usually be a relatively small pressure loss at the entrance to a cavity over and above the loss due to the normal viscous resistance, in reality the velocity with a finite $P_o$ and zero $X$ would not be infinite, but some large number. The argument, nevertheless, is valid.)

The simplest delivery system would be a large isothermal reservoir fitted with a ram. This two channel system—an isothermal reservoir and a channel which is being filled—is shown in Fig. 5. For the reservoir,

$$V_1 = \left(\frac{P_r - P_o}{X_1 R_1}\right)^n \qquad \text{Eq. 13}$$

where $P_r$ is the ram pressure and $P_o$ is the pressure at the end of the channel one and the entrance to channel two. If the reservoir is long relative to the length of travel of the ram, $X_1$ is constant since the reservoir is filled for all $\theta$, and $R_1$ is constant if the reservoir is actually isothermal.

For an incompressible fluid the volumetric flow rates in the two channels are equal at any time so

$$\frac{V_1}{V} = \frac{A_2}{A_{x1}} = s \qquad \text{Eq. 14}$$

and $V$ is the velocity in channel two, the cavity. Then

$$V = \frac{1}{s}\left(\frac{P_r - P_o}{X_1 R_1}\right)^n \qquad \text{Eq. 15}$$

Since $X_1$ does not vary, it is convenient to consider the entire group at the total resistance to flow in the reservoir, $R_T$. Since this resistance is defined in terms of the velocity in the cavity, it is a function of the cavity cross-section as well as the reservoir cross-section. Equation 15 can then be written in the form

$$V = \left(\frac{P_r - P_o}{R_T}\right)^n \qquad \text{Eq. 16}$$

If there are a number of filled channels preceding the cavity in series, i.e. a nozzle-runner system, then the total resistance in the reservoir is replaced by the total resistance in the reservoir and all the preceding channels,

$$R_T = \sum_1^p s_i^{\frac{1}{n}} X_i R_i \qquad \text{Eq. 17}$$

where $p$ is the number of channels preceding the cavity and $s_i$ is the ratio of the cross-section of the unfilled cavity to the cross-section of Channel $i$. If any or all of the preceding channels are non-isothermal, it can be shown by methods similar to those used earlier, that Eq. 17 is valid but $R_T$ becomes time dependent, i.e., $R_T = R_T(\theta)$.

The cavity inlet pressure can be obtained explicitly from Eq. 16 since $P_o$ is zero when the flow enters the cavity,

$$\frac{P_o}{P_r} = 1 - \frac{R_T(\theta)}{R_T(0)}\left(\frac{V}{V_o}\right)^{\frac{1}{n}} \qquad \text{Eq. 18}$$

where $R_T(0)$ is the resistance in the filled channels at the instant the flow enters the cavity and $V_o$ is the velocity at this time. If the filled channels are isothermal, the pressure ratio is seen to be a simple function of reduced velocity for $R_t(\theta)/R_t(0)$ is then one.

The interaction between the cavity and all the preceding channels can be viewed a number of ways. In Eq. 11 the interaction appears as $P_o$ (of course, if the previous channels are non-isothermal there is also a temperature interaction). Alternately, the interaction may be considered in terms of the ram pressure and $R_T$ by combining Eqs. 11 and 16.

$$V = \left(\frac{P_r}{XR(\theta) + R_T(\theta)}\right)^n \qquad \text{Eq. 19}$$

This equation has the same form as Eq. 11 and the denominator can be considered to be the total resistance of the entire system at any time. In terms of $V_o$ and $R_T$

$$\frac{V}{V_o} = \left[\frac{R_T(\theta)}{Xk(\theta) + R_T(\theta)}\right]^n \qquad \text{Eq. 20}$$

and finally, if the preceding channels are *isothermal*, the interactions can be defined completely in terms of $V_o$ and $P_r$,

$$\frac{V}{V_o} = \left(\frac{V_o^{\frac{1}{n}} XR(\theta)}{P_r} + 1\right)^n \qquad \text{Eq. 21}$$

The above analysis has neglected a number of contributions to the pressure drop such as entrance and exit effects between channels, etc., but these are all expected to be small. However, there are some important reservations which must be made concerning the reservoir, which in this work is the cylinder of the injection molding press.

The pressure is applied to the polymer in the cylinder by a ram which itself is pressurized by a hydraulic fluid. In the early stages of the flow the total resistance to flow of the system will be small since the wave front will not have progressed very far into the cold channels, and the velocity which would satisfy Eq. 19 would be so large that the hydraulic system will not be able to supply the corresponding volumetric flow rate. Consequently, the set pressure will not be reached and the ram will move forward at a rate controlled by the net pumping capacity of the hydraulic system. This net pumping capacity may be a function of ram pressure (3). In this case of "machine-controlled" flow, the velocity is set by the interaction between the hydraulic characteristics of the press and the die and the ram pressure is not an independent variable, but is fixed by Eq. 20. When the flow progresses far enough into the cold channels so that the total system resistance is high enough for the total pressure drop to equal the set pressure at the maximum volumetric flow rate of the press, the pressure control of the hydraulic system takes over and the ram pressure is held at the set pressure. The velocity is then controlled by the die resistance alone and we call this condition "die-controlled" flow. If the channels preceding the cavity are truly isothermal then, **(To page 188)**

# Problems with premix molding — Part 4

***Last article in series tells what to do about poor fill, deflashing, special properties, small parts, and mold maintenance***

**By R. B. White† and R. S. Jackson‡**

Polyester premix materials are notoriously poor in filling intricate mold shapes. Many an experienced molder of phenolic compounds has been sadly disillusioned with statements about the soft, free flowing characteristics of alkyd polyester compounds when he has attempted to run these materials in molds designed for phenolics.

The voids seen in Figs. 37[1] and 38, right, are located at "blind pockets" in the mold where air is easily trapped. Most of these parts would fill without difficulty using phenolic materials because phenolic compound starts out as hard dry powder and softens enough to flow into place under the molding pressure before becoming liquid enough to prevent the escape of air back through the granules of compound. Polyester glass compound is wet and gooey or becomes so rapidly under heat. It is also stringy enough, due to the long fiber reinforcement material, to resist being pressed into narrow parts of the mold until the pressure exerted has compacted it into a fairly dense "plug" at the entrance to any such narrow opening. Thus the air is prevented from escaping before there is any flow into the pocket. Figure 39, p. 114, shows how this occurs.

There appear to be four primary solutions to this problem: 1) higher molding pressures, 2) part design to eliminate the blind pockets, 3) provision for the air to escape, and 4) compound formulations with a minimum tendency to "plug" in blind pockets.

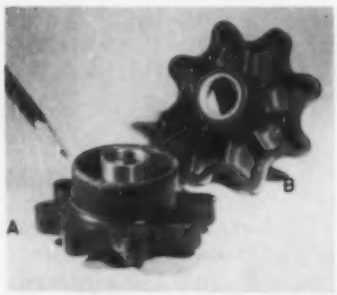



**FIG. 37:** Knob with molded dielectric guard ring shows problem with poor fill in blind pockets as indicated by pencil in **A.** Revised design, **B,** moved guard ring boss in against insert where trapped air is easily compressed with larger air pocket, which exists between the inside of the insert and its locating pin in the mold. Note also that this change, plus coring of underside, effected substantial material savings.

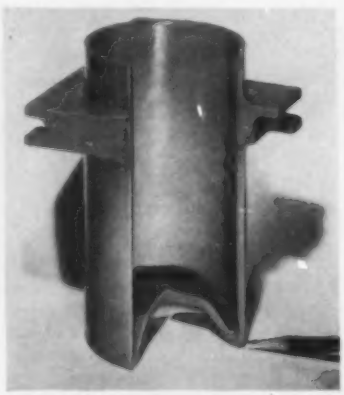


**FIG. 38:** Air puffer cylinder showing how long deep draw can create same problem as blind pockets—compound tends to seal off along side walls before air is entirely purged from bottom of mold.

Although it will be recognized that higher pressure will merely reduce the size of the voids in proportion to the pressure used, it is definitely helpful. It is usually best to plan to have available 3000 to 5000 p.s.i. for premix jobs even though a mere 500 p.s.i. will frequently be more than adequate on simple shapes.

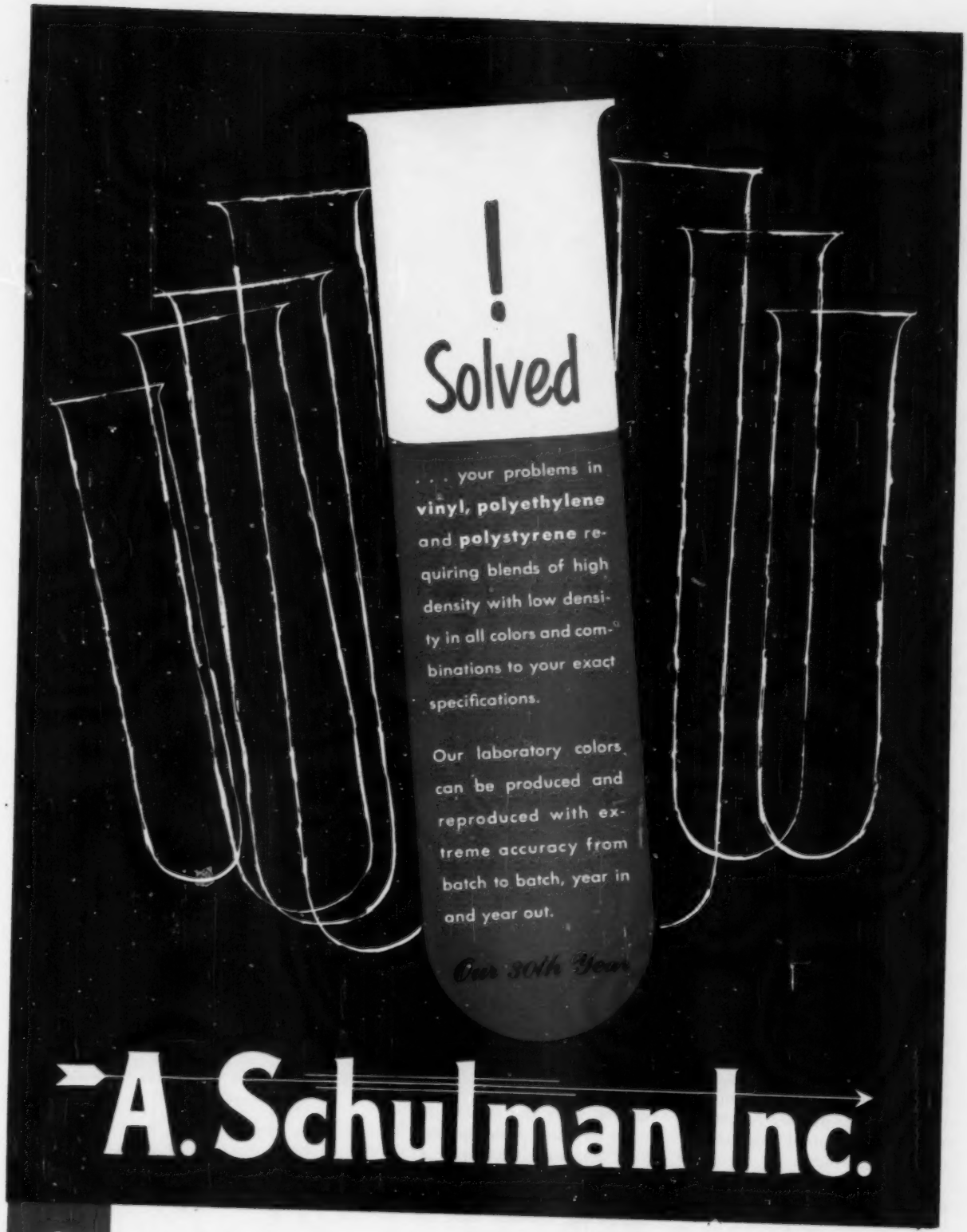
It seems elementary to say that if blind pockets are bad, one should design his parts at the outset to avoid them. Yet this is seldom done, because the apparatus designer rarely recognizes the extent of the molder's problem and does not discuss design modification with the same enthusiasm he brings to discussions of performance or direct cost. Often, in fact, he inadvertently invites trouble for himself and penalizes the better informed molder by being too busy to discuss these problems, and placing his job with a molder who offered a lower price because he did not know enough about these materials to be able to recognize the troubles ahead of him.

Perhaps more important is the molder's frequent failure to take the time to try to learn more about how the proposed part is to be used, and to understand the designer's real requirements so that he, the molder, can suggest design changes which would permit all parts of the mold to breathe properly during molding.

Figure 37 illustrates an example of a simple design change which could have saved molder

†President and ‡Chief Engineer, The Glastic Corp., 4321 Glenridge Rd., Cleveland, Ohio. Part 1, dealing with strength, variations and voids, appeared in MPI, March 1959, p. 117; Part 2, which discussed cracks, ran in MPI, May 1959, p. 115; Part 3, concerning sticking, warping, inserts, and thin-walls, ran in MPI, July 1959, p. 110.

[1]Figure numbers are continued from Part 3.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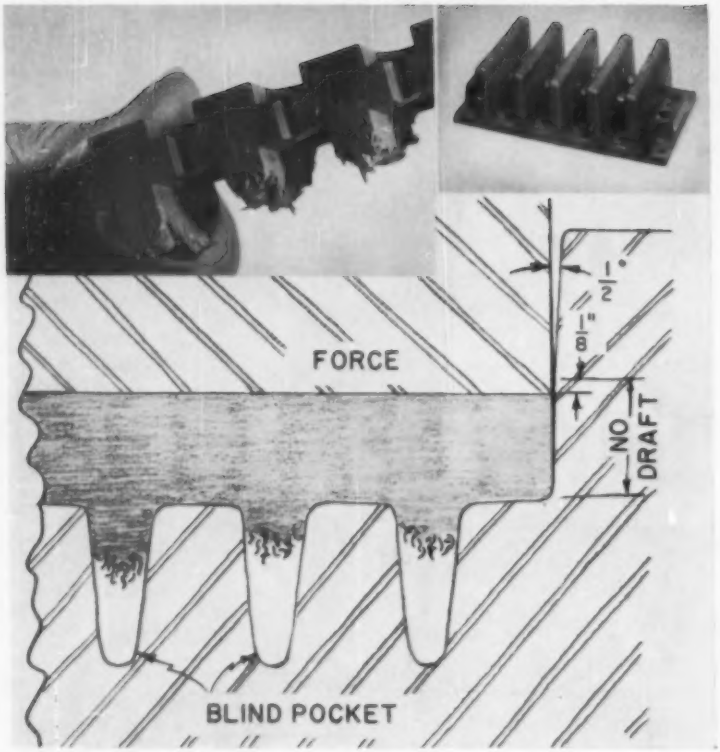



**FIG. 39:** Terminal strip, upper right, presents problem with multiple array of blind pockets. Schematic view of partially closed mold, below, shows how premix compound tends to become completely densified in upper portion, and thus seals pocket against escape of its trapped air before compound can enter very far into the pocket. Inset at upper left is a cross section through an actual partial molding made by stopping the press at partial closure.

and user many headaches by proper recognition at the outset. Design *A* had molded well in phenolic. When this part was changed to polyester-glass to obtain improved impact and weathering resistance, it was awarded to a relatively inexperienced RP molder who proceeded to tool it on the basis of the old design as seen in Figure 37A.

When repeated attempts to eliminate the voiding seen in this part failed, a re-examination of the user's requirements revealed that Design *B* was readily adaptable; while this required retooling, it ended the trouble.

It is common practice to bleed air out of blind pockets by locating knock-out pins in such areas; but while this practice is helpful with premix compound, it is not nearly as effective as with phenolics because the liquid constituents of the compound will run into almost any clearance areas and freeze there, thus sealing them against any breathing action on future shots.

Figure 40, right, shows a self-cleaning design of ejector-pin which we have found to be quite effective. Flash around the ejector-pin is given enough body so that it actually clears itself each time the pin operates.

Another very helpful procedure is to provide two or more parting lines in the mold since it will usually breathe quite adequately along a parting line. This involves a more complicated molding operation since the central portion must be raised from the base for flash cleaning during each cycle, but it is very effective with difficult deep draw parts such as the Air piston cylinder seen in Fig. 38. The mold for this part employs three parting lines as seen in Fig. 41, right.

Where especially difficult venting problems are encountered, it may be advantageous to use actual bleeders which allow some compound to escape, along with the unwanted air. This technique proved very effective with the fan blades seen in Fig. 42A, p. 118, where a 1/32 times 1/16-in. vent at the tip of each blade is designed into the mold at the parting line. This involved extra cost in wasted material and finishing operations, but materially reduced scrap due to non-fill voids.

The coil shell mold seen in Fig. 43, p. 118, provided no easy way to accomplish any of the above correctives and a device which employs the unique properties of polyester premix materials was employed. A piece of chopped strand re-in- **(To page 118)**

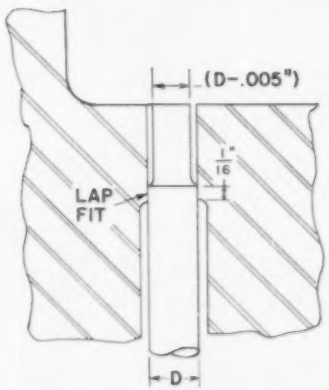



**FIG. 40:** Self cleaning ejector pin design. This pin allows air escape, provides a pocket to catch last extremities of air, does not allow resin to get into the lower extremities of the pin cavity, does not have a long enough close-fit to permit the pin to freeze up when resin cures up between it and the bore, and provides sufficient pin flash to be easily removed by hand.

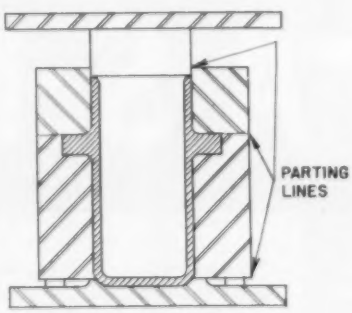
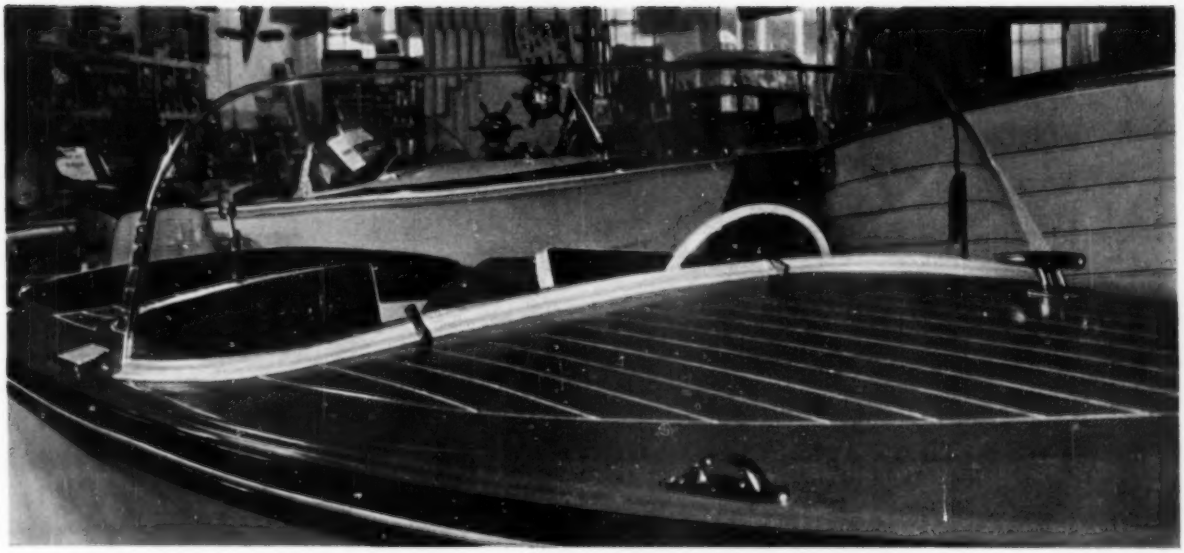



**FIG. 41:** Split mold design for properly breathing air puffer cylinder (See Fig. 38, p. 112) at critical points.



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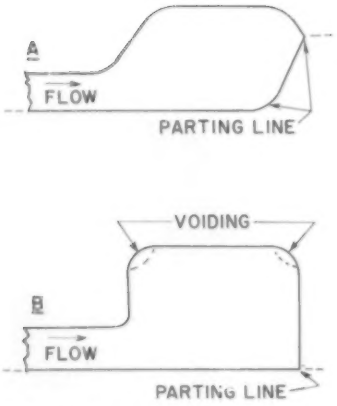


**FIG. 42:** Good, **A,** and bad, **B,** fan blade design. (See actual fan in Fig. 21, MPI, May 1959, p. 122). Note how smooth flow lines help to purge air ahead of advancing compound, also how a bleeder at the tip end will help to flush out the trapped air.

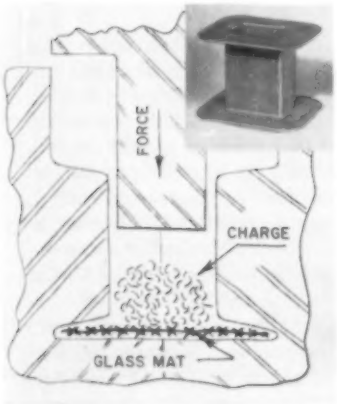


**FIG. 43:** Chopped glass mat is used to breathe difficult extremities of the split cavity coil form mold.

forcing mat was placed in the bottom of the mold so that the entire bottom surface of the mold was covered. During molding, the premix runs out to fill the mold completely on **top** of the mat before it starts to be forced **through** the mat. In this way, the mat (which is very air permeable) provides an escape path for trapped air. When the mold is nearly home, enough pressure develops within the mold to force the compound down through the mat; the glass mat becomes an integral part of the molding and actually strengthens the part! This technique has many uses in not only strengthening premix parts but also in eliminating voids.

Proper compound formulation can make a tremendous difference in these voiding problems. Obviously, a "dry," loose mix will be more air permeable than a wet, sticky mix (at mold temperature). The former can be attained to a fair degree with polyesters, if the user does not insist on the ultimate in physical properties, since this property requires high loadings of non-blocking fillers such as kaolinite. J. B. Crenshaw comments on this question in his S.P.I. Paper prepared for the 1957 Conference at Chicago. Choice of catalyst can also be critical in controlling this problem. A high temperature catalyst, such as tertiary butyl perbenzoate, will give much less trouble with precure and dead-end "burning" than the commonly used but highly reactive benzoyl peroxide, for instance. A primary requisite is that the premix compound be uniform! A compound which will "drift" with age may have to be designed to attain optimum molding properties a month or more after manufacture (to avoid becoming excessively stiff within a few days after manufacture) and obviously will be too wet before that time.

Variation in specific gravity can cause trouble through changes in the actual volume of a carefully weighed charge from batch to batch. Press closing speeds must be carefully adjusted to meet the requirements of a particular part and then just as carefully maintained thereafter. Any variation in gel time of the compound will obviously upset this balance. Gel time on premix compounds is controlled by exotherm measurements. On ordinary molding jobs, an "inflection point" time range from 100 to 150 sec. at 300° F. will be found quite tolerable. On fussy void problem jobs, we try to hold this range to 115 to 135 seconds. The "inflection point" time is the time required for the test sample to increase from 150° F. to the inflection or sudden rise point on the temperature curve. This procedure is further discussed by Torres and Feuer in an S.P.I. Paper which was read for the 1959 Conference in Chicago.

### Deflashing

Flash removal is more of a problem with reinforced premix compounds than for other thermosetting materials because the flash is usually tougher and also thicker, because of the venting problems described earlier in this article (MPI, June 1959). Flash removal costs often exceed the molding costs of these materials and careful attention to the part design can pay big dividends by simplifying this problem.

Figure 44, below, shows the fibrous nature of the flash obtained and also how easily it can be removed when placed in a single external plane.

Internal flash, in kiss-off areas, usually requires a hand filing, drilling, or punching operation, as seen in Fig. 45, p. 119, because of this toughness. Simple hand rubbing or buffing operations are quite adequate, however, for parting lines which are pressed

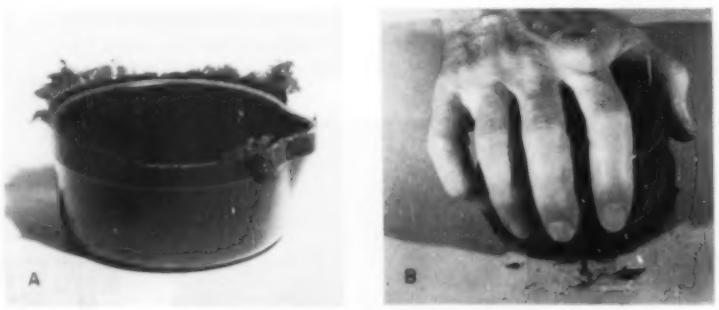


**FIG. 44:** Fibrous flash on a lightning arrestor cap, **A,** is too hard to remove simply by hand rubbing. However, it is easily removed with a hand sanding operation, **B,** provided the part is designed to place the flash in a single external flat plane, as in this instance.

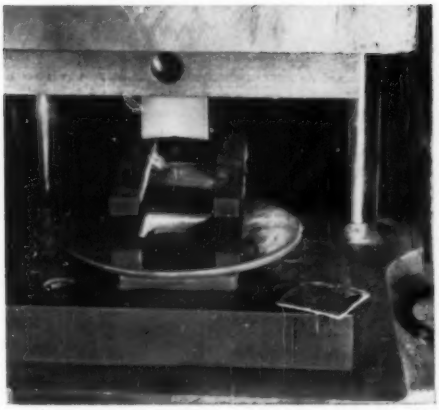

**FIG. 45:** Flash of irregular or internal faces, as with the plug in the center hole of this flange, must be removed either by hand filing or by punching. The latter can be fast and economical with relatively simple tools as shown here.

tightly together before molding, as in a split cavity mold, providing care is taken to get an accurate fit (maximum gap 0.002 in.) of the matching mold surfaces. This is illustrated in Fig. 46, below.

Tumbling can be employed with these materials, but only where surface finish is unimportant, since tumbling action which is rough enough to remove the flash will usually roughen all the surfaces of the parts.

Simple special-purpose tools for flash removal can often be located right at the molding press to permit handling as part of the molding cycle when the part itself is originally designed with this in mind. An example is illustrated in Fig. 47, below.

**FIG. 46:** Flash from insulator made in a tightly fitting split cavity mold can be removed quite rapidly with a simple buffing operation. Mold must be designed for easy regrinding of the matching surfaces, since a small amount of wear will occur and the finishing problem becomes rapidly more severe as the flash thickens.

**Special properties**

*Surface appearance:* Glass polyester premix materials usually have a characteristic surface waviness or ripple as seen in Fig. 48, p. 122, which is objectionable in some applications. It can be improved by proper selection of fillers and resins, particularly by using highly filled compositions which tend to have low shrinkage and are not distorted by heavy glass concentrations. Surface appearances can also be improved by using higher mold temperatures, provided other needed properties are not sacrificed. Where a high-gloss surface is not required, ripple markings will practically disappear if the molds are given a fine satin finish by vapor blasting.

*Color:* Polyester premixes lend themselves beautifully to a full rainbow range of colors. Pigments and dyes are easily blended into the mixes and usually "cover" all the constituents, including the glass, giving a fine uniform appearance in the finished parts. However, the simple addition of color may lead to all sorts of unanticipated problems, such as reduced strength, shortened shelf life, slower cure, bad leaching on outdoor exposure or heat exposure, reduced electrical properties, etc., not to mention such simple processing problems as the need to clean all equipment for each change in color, and inability to use up "remainder" lots of mixes prepared in a non-standard color for any specific job.

It should also be noted that light or natural colors will more readily show dirt smears normally introduced when preparing the mix in sigma blade mixers. This condition is illustrated in Fig. 48, and results from the rubbing action of the mixer against wads of glass in the compound during mixing. The amount of metal rubbed into the compound is insignificant and becomes thoroughly dispersed during the next revolution of the mixer, but of course, a new smear appears to take its place. Special Hastelloy, or chrome-plated mixing equipment, can be used to avoid this problem and where this and the special handling for complete cleanliness are justified, pastel colors are available.

*Weathering:* Most glass polyester premixes will re- **(To page 122)**

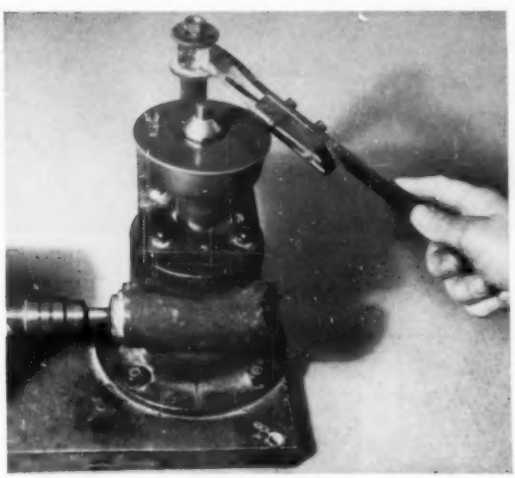

**FIG. 47:** Where flash can be placed in flat circle, such as with this molded flange, simple fixtures and fast operation were possible.

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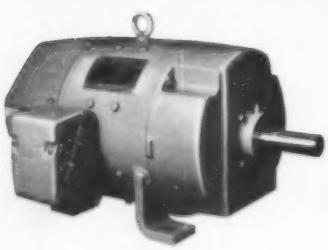

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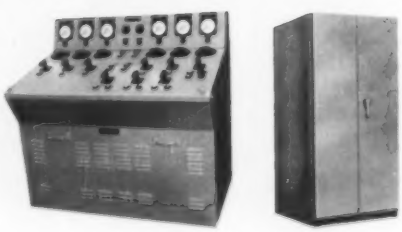

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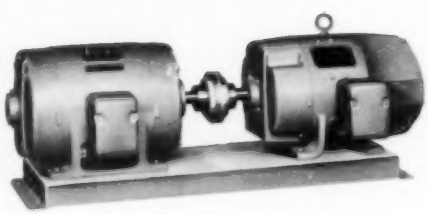

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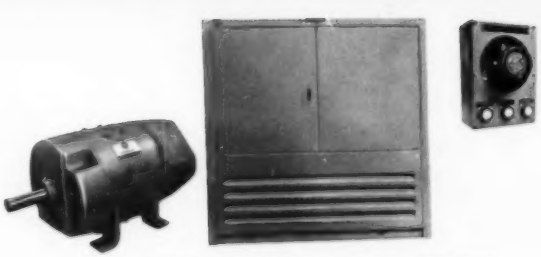

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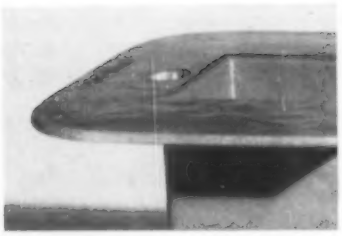


**FIG. 48:** "Rippled" surface of glass premix molding.

sist any major degradation even under the most severe weathering conditions, but some surface chalking can be expected. Improper selection of fillers can exaggerate this condition. Calcium sulphate for instance, makes a very desirable filler from many processing standpoints; it makes a mix which flows smoothly and without segregation, it does not shorten shelf life as do many other inexpensive fillers such as calcium carbonate, but its slight solubility in water materially hastens the chalking and erosion rate under weathering. A proper selection of resins is also important. Some, such as the acrylic monomer types are far more stable than most of the general-purpose resins against ultra-violet attack. When properly formulated, the weatherability of proper premix formulations appears to be practically unlimited. Such parts as the standoff insulator, Fig. 46, and lightning arrestor cap, Fig. 44, mentioned earlier in this article, have been in service for 5 to 6 years with no measurable degradation other than slight surface chalking. Their appearance is outstandingly better than that of comparable phenolic parts after similar periods of outdoor service.

*Carbon tracking:* While resistance to carbon tracking under the action of electrical leakage currents or arc flashes between conductors on the surface of glass polyester premix parts is considered outstandingly good (ASTM value under D495-48T of approximately 150 to 180 sec. compared to 5 to 10 sec. for phenolic), it is still not up to ceramics, such as porcelain or alumina. As a result most such premix materials are not considered satisfactory for use at voltages above 5 kv. indoors or 1 kv. outdoors, unless very long surface paths exist between conductors. Figure 49A, below, shows such a carbon track developing on the surface of a conventional glass polyester premix part under accelerated test conditions.

Much development work is currently being done on this problem, and there is reason to believe that these limits will be substantially raised in the near future through use of improved formulations containing alumina and other arc suppressing fillers which resist the formation of such carbon tracks (Rostone patent #2,-768,264). Figure 49B shows one such improved composition.

### Economics of small parts

Whereas the cost of large glass polyester premix parts is generally only a little more than the same parts in phenolic materials (they may even be considerably less expensive where high-impact phenolics are required), this situation is very unlikely to be true of small parts, weighing less than 1 or 2 ounces.

Glass polyester is much more awkward to handle in preparing each charge for the mold than is a phenolic powder which can be processed through automatic equipment into preform slugs of accurate weight, or rapidly measured volumetrically at the press by the operator. Premix is most commonly weighed into individual charges at the press by the operator who must pull out a proper amount of stringy, sticky material from the large masses which come from the mixer. Extruded rope or logs of glass premix are becoming popular today because of their easier handling, but even so, accurate measuring of charges is not easy because the per-inch weight of such rope material is not uniform, and precise cutting off of this fibrous material is difficult. Yet accurately measured charges are necessary with these materials because, as is covered under "Mold maintenance," below, flash-type molds do not work well and positive molds must have accurate charge weights to produce accurate pieces. In multiple cavity molding, such as is logical for small parts, accurate charges are also necessary to produce properly filled parts from all cavities.

In addition to the loading problem, the greater difficulty of removing flash from premix molded parts makes it more difficult to use automatic flash removal techniques that are common with general-purpose materials, such as phenolics and ureas.

All these factors tend to make labor costs relatively high, particularly on small parts premix.

There is another consideration. The material savings from the use of thinner sections, often possible on large parts because of the higher **(To page 194)**

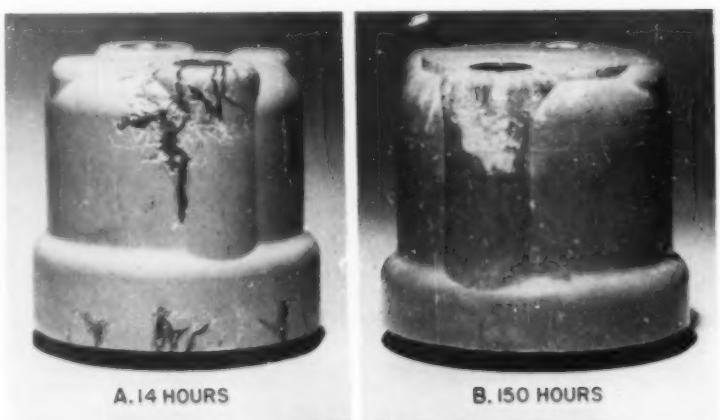
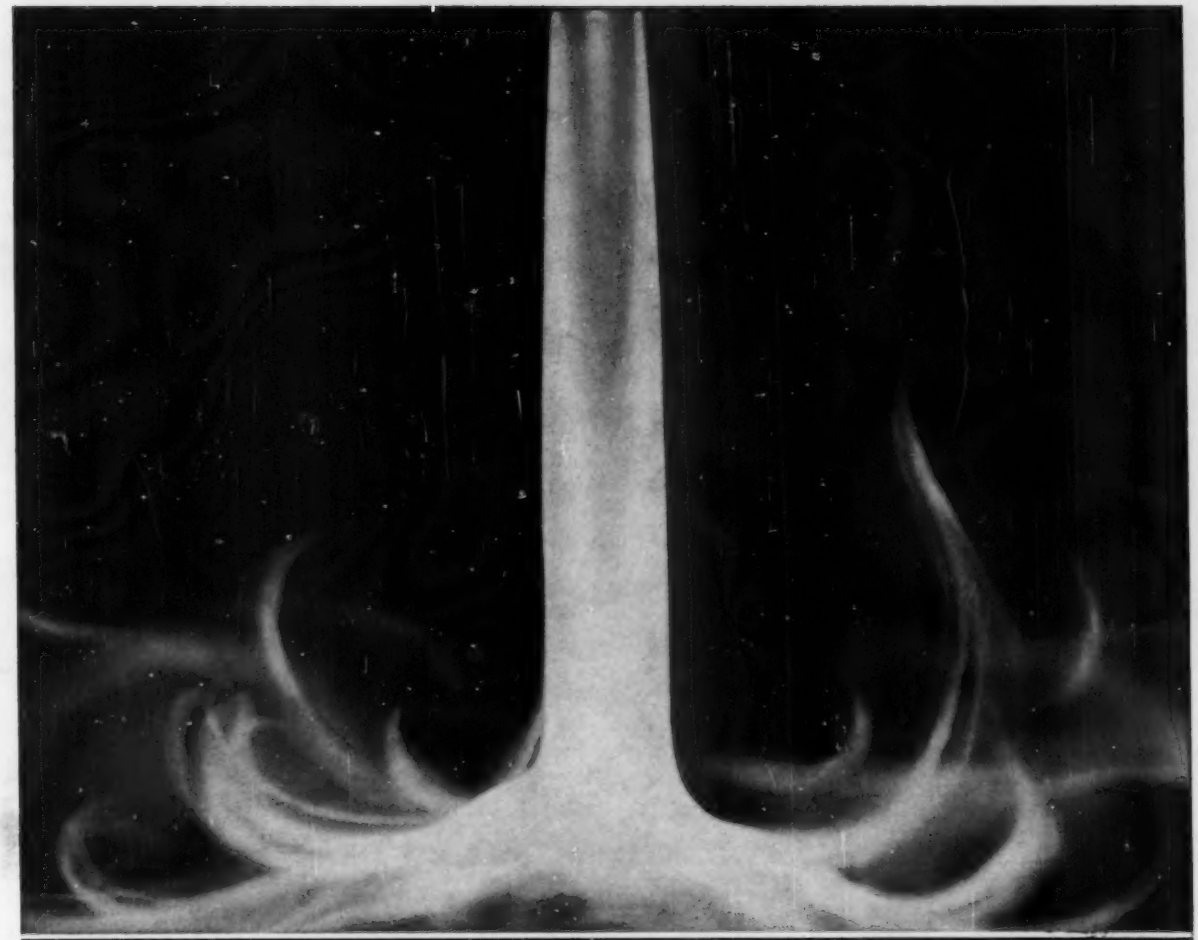



**FIG. 49:** High voltage insulator after accelerated testing in salt fog chamber. Note how carbon track is reaching across the face of conventional polyester premix molding seen in **A.** Complete failure occurred on this part in less than 15 hours. Non-tracking polyester glass material in **B** shows slight erosion after being subjected to 10 times this exposure.



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|---|---|---|---|
| Polyester Resin | (parts by weight) | 100.0 | 100.0 |
| Chlorowax 70 | (parts by weight) | — | 12.5 |
| Antimony Trioxide | (parts by weight) | — | 12.5 |
| Luperco ATC | (parts by weight) | 2.0 | 2.0 |
| 3 oz. Glass Mat | (parts by weight) | 60.0 | 60.0 |
| Flexural strength psi (dry) | | 26,400 | 27,500 |
| Flexural strength psi (wet) | | 24,000 | 25,000 |
| Tensile strength psi (dry) | | 15,000 | 15,700 |
| Tensile strength psi (wet) | | 14,000 | 14,300 |
| Flame-out (seconds) | | Burns | 1 |
| **POLYETHYLENE SYSTEM*** | | | |
| Polyethylene Resin | (parts by weight) | 100.0 | 85.0 — 63.0 |
| Chlorowax 70 | (parts by weight) | — | 7.5 — 18.5 |
| Antimony Trioxide | (parts by weight) | — | 7.5 — 18.5 |
| Antioxidant | (parts by weight) | .5 | .5 |
| Tensile strength (psi) | | 1,800 | 1,650—1,500 |
| % elongation | | 600 | 590— 200 |
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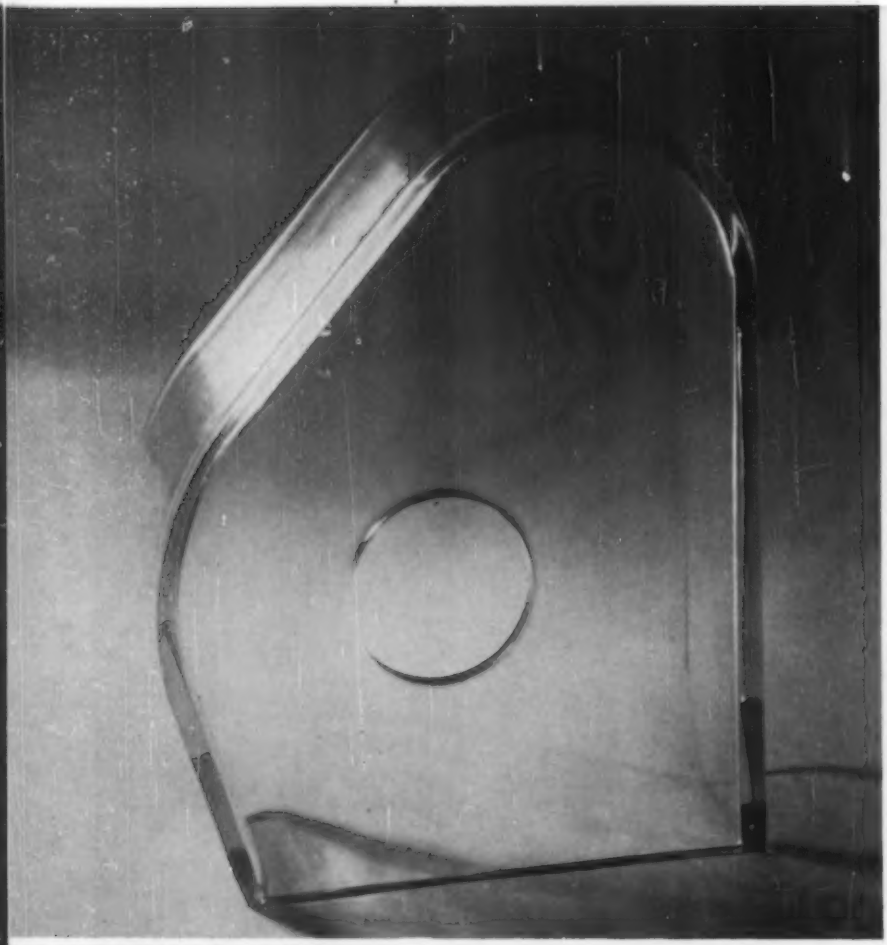

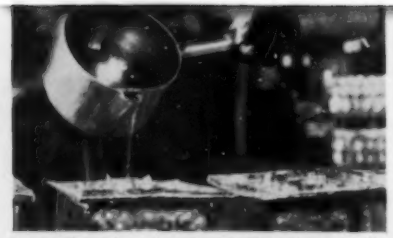

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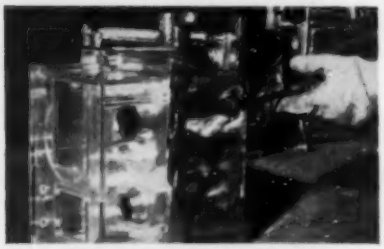

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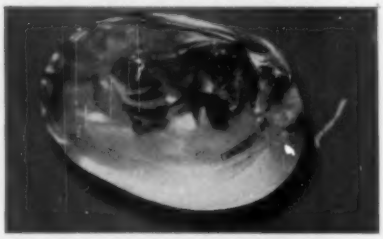

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# Effectiveness of coupling agents in glass-reinforced plastics

By Byron M. Vanderbilt†

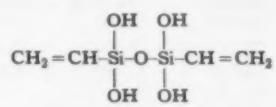
The literature indicates that one would expect little or no copolymerization of the vinyl silane coupling agent under the conditions that polyester glass-reinforced plastics are usually cured. Benzoyl peroxide is reported to be particularly ineffective as a catalyst for the polymerization and copolymerization of vinyl silane esters. Experiments reported herewith in which a polyester is cured with benzoyl peroxide at 220 to 240° F. and with dicumene peroxide at 275° F. indicate better copolymerization with vinyl silane in the latter case.

Results are reported for laminates prepared with an epoxy resin, a polyester, and a polybutadiene-type resin, in which the coupling agent is 1) omitted, 2) added in resin solution, and 3) applied to the glass surface. The polybutadiene-type resin is a more sensitive tool for studying glass-resin adhesion than are the other two resins. The proposal is made that the limiting factor in the strength of glass-reinforced plastics of the polyester and polybutadiene types may be the adhesion of the coupling agent to the glass, rather than coupling with the resin.

It is generally agreed that improved strength and moisture resistance result when a so-called finish or coupling agent is employed on the glass surface of a reinforced plastic. The most widely used finishes at the present time are silicon and chromium compounds containing certain groups that are believed to be capable of reacting with both the resin as well as with the glass surface.[1]

The vinyl silane type is the most widely used glass finish for reinforced plastics and finds its big use with polyesters. Vinyl trichlorosilane was the active form which was used originally for attaching the $CH_2 = CH\text{-}Si\text{-}$ group to the glass.

The glass was contacted with the trichloride either as a vapor or in a solution in an inert solvent such as xylene(2). However, for reason of expedience, industry chooses to apply the silane in water solution as the vinyl silanetriol, $CH_2{=}CH\text{-}Si(OH)_3$, which may actually be largely condensed as in this formula:



More condensed linear and cyclic structures, no doubt, are present. Whether a siloxane finish applied to glass from an aqueous solution is equivalent to that prepared via the chlorosilane is a supposition that is debatable.

However, the question appears to be largely an academic one, since all fiber glass manufacturers and weavers apparently use the aqueous method.

When glass containing the vinyl silane finish is used in the preparation of a polyester laminate (laminate is used here as a generic term for reinforced plastic structures generally), it has generally been assumed that these vinyl groups entered into the polymerization reaction with the polyester and the crosslinking monomer. However, some investigators think that no chemical bonding results and that the polyester is bound to the glass purely by physical forces(3).

In these laboratories, we have recently had occasion to work with an all-hydrocarbon blend for the preparation of reinforced plastics(4). This blend, consisting of various proportions of a liquid butadiene-styrene copolymer (presently named C-oil) and a crosslinking monomer such as vinyltoluene, being all hydrocarbon in nature, does not chemisorb on the glass surface as well as do the more polar polyesters or the epoxies.

Thus, the glass finish plays a greater role in the wetting and adhesion of the glass to this hydrocarbon resin than with resins previously used. This makes possible a more sensitive system than

*Reg. U. S. Pat. Off.

†Chemicals Research Div., Esso Research and Engineering Co.

[1]Numbers in parentheses link to references at end of article, p. 200.

has previously been available for studying the glass-resin bond in reinforced plastics.

### Preparation of specimens

All of the data reported in this paper are for laminates prepared from 14 plies of glass cloth, 181 type, obtained from the Hess-Goldsmith Co. Glass cloth containing either No. 136 or A-172 vinyl silane finish was found to be equivalent. Heat-cleaned cloth, i.e., without finish, was also used as well as cloth containing A-1100 (amine type) and Volan (chrome type) finishes.

The C-oil used was an 80/20 copolymer of butadiene and styrene having a viscosity of about 4500 poises at room temperature. Vinyltoluene was the commercial grade marketed by the Dow Chemical Co.

A typical laminate used in these studies was prepared as follows: A resin blend consisting of

60 parts C-oil
40 parts vinyltoluene
2 parts 55% divinylbenzene
2 parts dicumene peroxide
2 parts di-*t*-butyl peroxide

was used for impregnating 14 layers of 181-136 glass cloth in a 0.125-in.-deep cavity mold. Cure was carried out for 1 hr. at 300° F. The laminate was then cut into halves and one portion post-cured for 2 hr. at 320° F. in a hot air oven. Specimens, 3 by ½ in., were cut parallel to the weave. Flexural strength measurements have proven to be the most sensitive measurements of physical properties in order to pick up differences in laminates resulting from the finishes employed.

In studies with polyesters, Atlac-382 (Atlas Powder Co.) was primarily used, although some work was done with Paraplex-43 (Rohm and Haas Co.) and Vibrin X-1088 (Naugatuck Chemical). Most of the work with epoxies was with Epon-828 (Shell Chemical Co.) using their Z Hardener.

### Polymerization characteristics of vinyl silanes

In the studies dealing with unsaturated silanes as coupling agents for polyester-glass laminates, no one appears to have raised the question whether one would expect copolymerization under the conditions employed. It is very difficult at best to determine whether the vinyl-silicon group on a glass surface can be copolymerized with a simple monomer such as styrene. However, the vinyl silane esters are monomeric materials which can be handled in the usual manner; since these esters have three oxygen atoms attached to the silicon as does the vinyl silane attached to the glass surface, they should have similar, although not identical, polymerization characteristics. Our discussion here is limited to the vinyl silane or vinyl siloxane type coupling agent.

When one examines the literature dealing with the polymerization and copolymerization of vinyl silane esters, it is obvious that this class of compounds polymerize with difficulty. They do not approach the activity of monomers that can be converted to solid polymers and/or copolymers, such as styrene, methyl methacrylate, and the fumarates (polyesters). Investigators (5, 6) point out that benzoyl peroxide is a very poor catalyst for making either polymers or copolymers of vinyl triethoxysilane. When using a high temperature, 275° F. for 16 hr., and a catalyst effective at this temperature, i.e., di-*t*-butyl peroxide, a homopolymer was formed which was a viscous liquid. It ranged in molecular weight from 3000 to 8000. Air and moisture were both poisons to the reaction. Thompson (7) reports vinyl trialkoxysilanes to be the most active of the various silane ester monomers, but little success resulted when attempts were made to prepare copolymers of this silane and vinyl chloride, acrylonitrile, or chlorostyrene. When using 50/50 blends and heating with diacetyl peroxide at 122° F. for as long as 32 hr., very little copolymerization was observed to occur.

Although the siloxanes prepared by hydrolyzing vinyl trichlorosilane and the vinyl silane esters appear to polymerize somewhat more readily than do the simple silane esters, there is no clear evidence that copolymers

**Table I:** Effect of catalyst and cure temperature on properties of Atlac-382 polyester laminates[a]

| Catalyst[b] | Mold cure | | Post-cure[c] | | Flexural strength | | | Flexural strength after | | Time to failure in stress test[e] in water at 170° F. |
|---|---|---|---|---|---|---|---|---|---|---|
| | Time | Temp. | Time | Temp. | Room temp. | 170° F.[d] | 250° F.[d] | 2-hr. boil | 7-day boil | |
| | hr. | °F. | hr. | °F. | p.s.i. | p.s.i. | p.s.i. | p.s.i. | p.s.i. | hr. |
| BPO | 1 | 220 | None | | 43,500 | 46,500 | 27,000 | 44,500 | | 3½ |
| | 1 | 220 | 2 | 250 | 57,000 | 46,000 | 28,000 | 45,000 | | 5⅓ |
| BPO | 1 | 240 | None | | 53,000 | 48,000 | 24,000 | 50,000 | 39,000 | — |
| | 1 | 240 | 2 | 300 | 59,500 | 51,000 | 33,000 | 50,000 | 43,500 | 6½ |
| Dicup | 1 | 275 | None | | 59,500 | 55,500 | 41,500 | 55,000 | 50,000 | 5 |
| | 1 | 275 | 2 | 300 | 60,500 | 52,500 | 39,000 | 57,000 | 53,000 | 34 |

[a] The laminates were prepared with 100 parts of 50/50 Atlac-382/Vinyltoluene, 1 part catalyst, and 14 layers of 181 glass cloth with No. 136 finish. They were cured in a ⅛-in. mold and were 0.133 to 0.139 in. thick.
[b] BPO=benzoyl peroxide; Dicup=dicumene peroxide.
[c] Laminate cured at temperature indicated exposed to air in an oven.
[d] Specimens were held at temperature at least ½ hr. before testing; this may increase state of cure of an under-cured sample.
[e] Specimen 0.5 in. wide is supported as 2-in. span under water at 170° F. with stress of 75 lb. total weight for 1 hr. and then the weight is increased to 100 lb. and held until sample fails. This is a modification of a test developed by Shell Chemical Co. (8). The values greater than 1 hr. in Table I-IV include the 1 hr. under the 75-lb. load.

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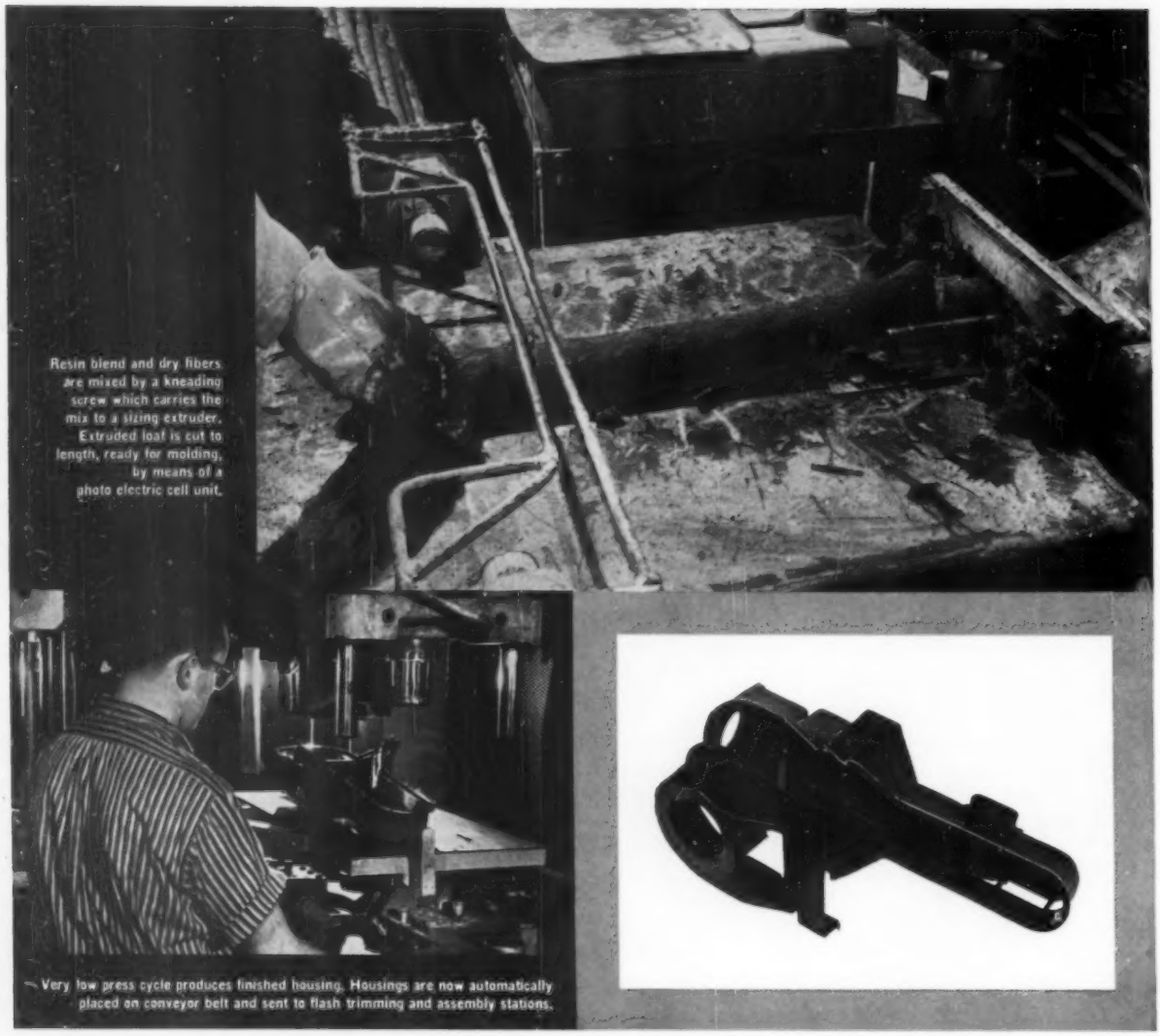
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**Table II:** Effect of coupling agents on properties of epoxy laminates[a]

| Property | No coupling agent[b] | | Coupling agent used | | | |
|---|---|---|---|---|---|---|
| | | | In resin[b] | | On glass[c] | |
| | Mold cure | Post cure | Mold cure | Post cure | Mold cure | Post cure |
| Flexural strength, | | | | | | |
| At room temp., p.s.i. | 57,000 | 54,000 | 49,000 | 60,000 | 70,000 | 69,500 |
| At 17° F., p.s.i. | 51,500 | 51,000 | 46,500 | 54,000 | 61,500 | 58,500 |
| After 2-hr. water boil, p.s.i. | 50,000 | 50,500 | 55,000 | 58,000 | 65,000 | 66,000 |
| After 7-day water boil, p.s.i. | 28,000 | 37,000 | 36,500 | — | 37,000 | 36,500 |
| Time to failure in stress test in water at 170° F. | 1 hr., 57 min. | 2 hr., 10 min. | 1 hr., 11 min. | 8 hr. | 29 hr. | 58 hr. |

[a]Recipe used was 100 parts of Epon 828 plus 19 parts of Z hardener. Each was cured in a mold for 1 hr. at 275° F., the laminate cut into halves, and one-half post-cured an additional 2 hr. at 300° F. in a hot-air oven.
[b]Heat-cleaned 181 glass cloth was used in preparing the laminates with no coupling agent and with coupling agent in the resin. In the latter case 1% of A-1100 was added to the resin.
[c]Volan-tested 181 cloth used. Volan-treated cloth proved to be better than cloth treated with A-1100.

can be formed with monomers such as styrene. Furthermore, such siloxanes are reported(6) to be gummy substances unless prepared under controlled alkaline conditions. Thus, even if such a "coupling agent" were chemically attached to both the resin and the glass, one would expect little or no contribution at all to the over-all bond strength.

### Effect of curing temperature on glass-reinforced polyesters

It is fair to assume that copolymerization of a polyester composition and a vinyl silane coating on a glass surface is more likely to occur at temperatures in the range of 250 to 300° F., using a peroxide having a good half-life in this temperature range, than at lower temperatures using benzoyl peroxide. This approach has been tested in our laboratories using Atlac-382 polyester. A 50/50 weight mixture of Atlac-382 (monomer free) and vinyltoluene was used. A relatively high proportion of the vinyltoluene was employed, since separate tests had indicated that vinyltoluene has a greater likelihood of reacting with the vinyl silane than does the polyester.

Data are summarized in Table I, p. 126. It may be noted that in the second run with benzoyl peroxide, a post-cure at least equivalent to that used when dicumene peroxide was the catalyst was employed. Flexural strengths at room temperature of laminates prepared with benzoyl peroxide and post-cured were equivalent to those prepared with dicumene peroxide catalyst. However, all strength tests at elevated temperatures and retention of strength after contact with water indicated the laminates cured with dicumene peroxide to be superior. These are the properties that one would reasonably expect the resin-vinyl silane bond to influence.

Similar experiments were carried out with Paraplex-43 using both benzoyl peroxide and dicumene peroxide as catalysts. The trend was the same as for Atlac-382 material.

Several laminates have been made with polyesters using various accelerated catalyst systems and curing at room temperature. When using Atlac-382 and benzoyl peroxide–N-phenyl morpholine as catalyst, a laminate was obtained that after 1 mo. had a flexural strength of 55,000 p.s.i. However, flexural strength measurements at elevated temperatures and water resistance tests on this and other laminates prepared at room temperature were invariably low. Although other factors may well influence the results obtained with laminates which were prepared in this manner, it is, likewise, true that minimum reaction of the vinyl silane would be expected at such low temperatures. Low polymerization temperatures tend to give higher molecular weight and stronger plastics than those cured at higher temperatures for a shorter time. Thus, the relatively poor quality of reinforced plastics prepared at ordinary temperature, as compared to like compositions cured at elevated temperatures, may well be due to a lower degree of copolymerization that is found with the vinyl silane coupling agent.

### Coupling agent added as solution in resin

As previously reported(9), if a vinyl silane ester is dissolved in the polyester resin prior to lamination, improved results are obtained with heat-cleaned glass as compared to when no coupling agent is present. This technique has been extended in our study using an all-hydrocarbon system, i.e., a liquid butadiene-styrene copolymer with vinyltoluene and other styrenes being used as crosslinking agents.

Laminates have been prepared with heat-cleaned glass using an epoxy, a polyester, and a polybutadiene-type resin, each with and without a suitable coupling agent dissolved in the liquid prepolymer. For control purposes, a typical laminate was prepared under like conditions for each resin except that glass cloth containing a suitable finish was used.

Data for the epoxy resin laminates are summarized in Table II, above. Use of the epoxy resin with heat-cleaned glass and no coupling agent results in laminates of good strength and fairly good strength retention after immersion in boiling water for 2 hours. However, such a laminate had a short life in water at 170° F. under stress, and although use of A-1100 dissolved in the resin improved this on the post-cure, use of glass with the Volan finish gave much superior water-resistant properties, based **(To page 130)**

# A new resource for Polystyrene

High impact and conventional Polystyrene plastic molding compounds will be manufactured by Amoco Chemicals at Joliet, Illinois. Large-scale commercial manufacturing facilities will go on stream in late 1961. Quantities for customer evaluation will be available from a product development plant also underway and scheduled to be completed by mid-1960.

In addition to these manufacturing facilities, Amoco is establishing a comprehensive technical service program to assist customers in the use of AMOCO Polystyrene. Research which has preceded the launching of this Polystyrene program will be expanded so that Amoco may continue to make important contributions in the field of polymer chemistry.

These production, technical service, research and other facilities are a multi-million dollar extension of Amoco Chemicals' plan for becoming a new resource to industry. If you mold or use Polystyrene, watch for further information about the progress of this Amoco Chemicals project.

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on this constant load flexure test. It is noted that this type of epoxy cure fails badly after immersion in boiling water for 7 days.

Table III, below, presents similar data for a polyester laminate. The flexural strength measurements carried out under dry conditions show a small but definite advantage for use of the silane, either on the glass or dissolved in the resin. However, when submitted to boiling water, only the laminate having the silane on the glass retains its strength, and in the case of Atlac-382 shows remarkable resistance to boiling water. The results with the 60/40 blend of Atlac-382/vinyltoluene indicated slightly better physical properties are obtained with this blend than with the 50/50 blend. This is probably due to the fact that it is closer to an equivalent ratio between the fumarate double bonds of the polyester and those of the styrene.

Results from a less complete study with a polyester of the diethylene glycol–maleic anhydride type followed the same general pattern as those obtained with Atlac-382.

Table IV, p. 132, presents data for laminates prepared with a 50/50 and a 60/40 blend of C-oil vinyltoluene. Laminates prepared with no coupling agent either in the resin or on the glass were very opaque in appearance, indicating poor wetting. This was reflected in low physical properties and poor moisture resistance. This, of course, is not surprising for a hydrocarbon-type resin.

When using the vinyl silane ester in the resin, quite good physical properties were obtained, and unlike the polyester, good resistance to boiling water resulted. However, as with the polyester, best results were obtained when the silane was present as a finish on the glass surface.

Due to the hydrocarbon nature of C-oil and thus the absence of secondary valence resin cross-linking such as hydrogen bonding, the resin tends to be more thermoplastic than the oxygen-containing polyesters. However, by use of some polyfunctional cross-linking agent such as divinylbenzene, it is possible to reduce this. This appears to be necessary in order to get a long life in the constant flexural stress test, which is a measure of creep in the presence of hot water. This is reflected in the last entry in Table IV.

### Discussion

The finish or coupling agent used in glass-reinforced plastics becomes increasingly important as the resin becomes less polar in nature. Based on work carried out in these laboratories as well as that reported in the literature, it is believed that sufficient information is now available so that one can conclude that the role of the glass finish, such as a silane, may well be a physical one, and may or may not give chemical bonding, depending upon conditions of cure. The physical effect is easily demonstrated by immersing heat-cleaned glass cloth and cloth containing a silane finish into C-oil/vinyltoluene blend containing an oil-soluble dye. Both become colored, but most of the resin can be removed from the heat-cleaned cloth by a single dipping into water at room temperature. On the other hand, the cloth containing the silane retains its film of resin, even after repeated dippings into water.

Another example of physical effects imparted by the silane are the results obtained when an ethyl silane is substituted for the corresponding vinyl silane, either as the glass finish or as additive to the resin when using heat-cleaned glass. Others (10) report that vinyl silane is more effective than the corresponding methyl compound for bonding unsaturated polyester resin to glass. However, comparison of the corresponding ethyl and vinyl compounds would be better,

**Table III:** Effect of coupling agent on properties of polyester laminates[a]

| Property | No coupling agent | | Coupling agent used | | | |
|---|---|---|---|---|---|---|
| | | | In resin[b] | | On glass[c] | |
| | Mold cure | Post cure | Mold cure | Post cure | Mold cure | Post cure |
| 50/50 blend Atlac-382/vinyltoluene | | | | | | |
| Flexural strength, | | | | | | |
| At room temp., p.s.i. | 46,500 | 54,000 | 51,500 | 62,500 | 59,500 | 60,500 |
| At 170° F., p.s.i. | 37,000 | 45,000 | 52,000 | 57,500 | 55,500 | 52,500 |
| After 2-hr. water boil, p.s.i. | 20,000 | 20,000 | 34,000 | 35,000 | 55,000 | 57,000 |
| After 7-day water boil, p.s.i. | 16,500 | 19,000 | 33,000 | | 50,000 | 53,000 |
| Time to failure in stress test in water at 170° F. | 3 min. | 6 min. | 1 hr., 5 min. | 3¼ hr. | 5 hr. | 34 hr. |
| 60/40 blend Atlac-382/vinyltoluene[b] | | | | | | |
| Flexural strength, | | | | | | |
| At room temp., p.s.i. | | 46,000 | | 55,500 | | 62,000 |
| At 170° F., p.s.i. | | 38,500 | | 45,500 | | 55,000 |
| After 2-hr. water boil, p.s.i. | | 18,000 | | 34,000 | | 55,000 |
| After 7-day water boil, p.s.i. | | 16,000 | | 29,000 | | 45,000 |
| Time to failure in stress test in water at 170° F. | | 3 min. | | 9 hr. | | 59 hr. |

[a] Laminates were prepared with 1% of dicumene peroxide as catalyst, and cured in mold for 1 hr. at 275° F. Post-cure was at 300° F. in an air oven for 2 hr. for the 50/50 blend and 1 hr. for the 60/40 blend.
[b] 1% of A-172 vinyl silane ester added to total resin blend.
[c] Glass fabric 181, purchased with A-172 finish.

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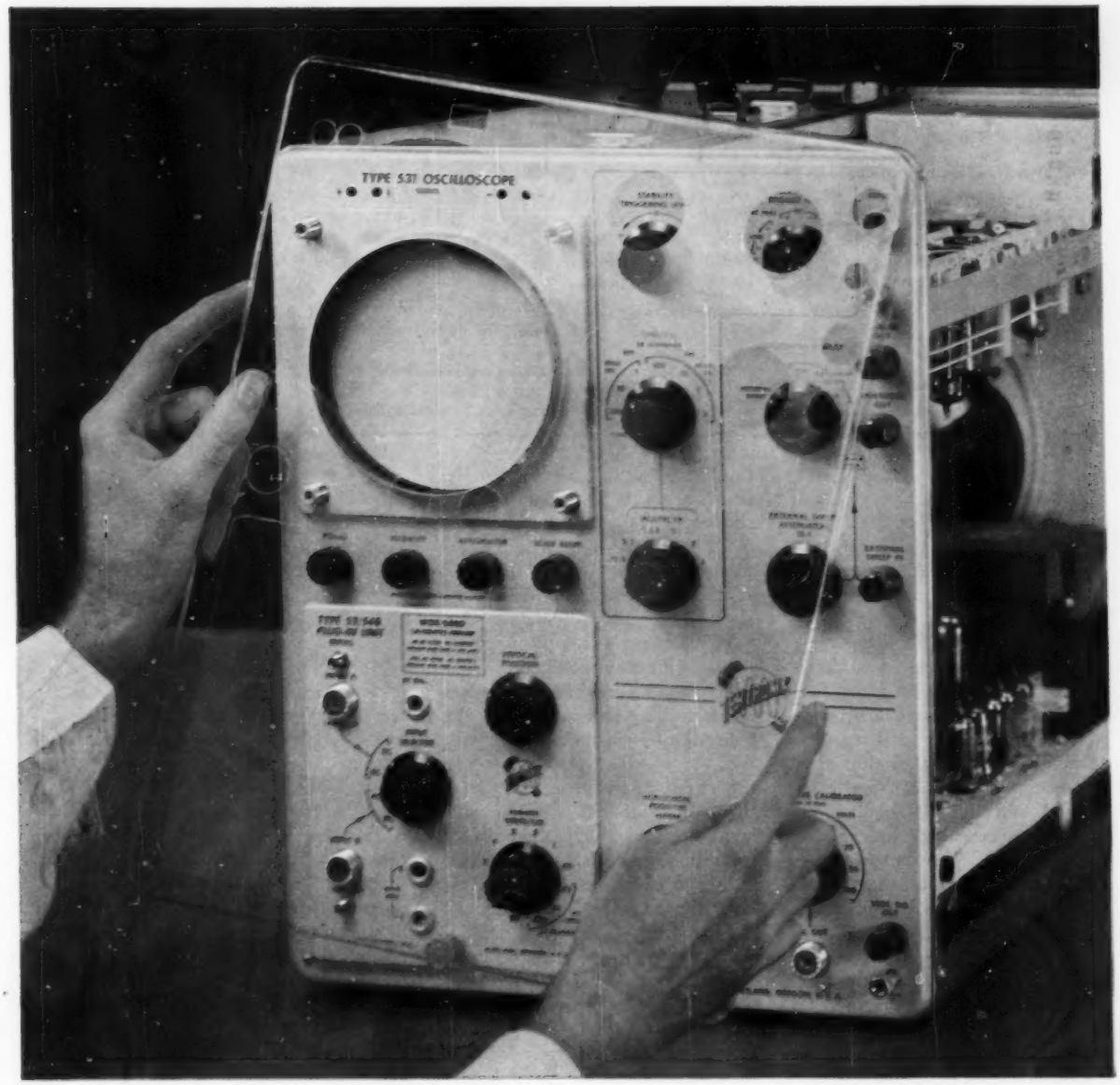


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**Table IV:** Effect of coupling agent on properties of C-oil resin laminates

| Property | No coupling agent | | Coupling agent used | | | |
|---|---|---|---|---|---|---|
| | | | In resin[c] | | On glass | |
| | Mold cure | Post cure | Mold cure | Post cure | Mold cure | Post cure |
| 50/50 blend C-oil/vinyltoluene[a] | | | | | | |
| Flexural strength, | | | | | | |
| At room temp., p.s.i. | | 35,000 | | 60,000 | | 62,000 |
| At 170° F., p.s.i. | | 26,500 | | 48,500 | | 48,000 |
| After 2-hr. water boil, p.s.i. | | 12,000 | | 49,000 | | 58,500 |
| After 7-day water boil, p.s.i. | | 11,500 | | 38,000 | | 52,000 |
| Time to failure in stress test in water at 170° F. | | Immediate | | 1 hr., 2 min. | | 5½ hr. |
| 60/40 blend C-oil/vinyltoluene[b] | | | | | | |
| Flexural strength, | | | | | | |
| At room temp., p.s.i. | 25,000 | 38,000 | 59,000 | 60,000 | 60,000 | 61,000 |
| At 170° F., p.s.i. | 17,000 | 29,000 | 25,500 | 48,000 | 33,500 | 51,000 |
| After 2-hr. water boil, p.s.i. | 10,000 | 10,500 | 50,000 | 54,000 | 56,000 | 58,000 |
| After 7-day water boil, p.s.i. | 9,000 | 11,000 | 48,000 | 50,000 | 47,500 | 51,500 |
| Time to failure in stress in water at 170° F. | Immediate | Immediate | Immediate | 1 hr., 39 min. | 8 min. | 91 hr. |

[a] Laminates cured in mold for 1 hr. at 300° F. and then post-cured for an additional 2 hr. at 320° F. in a hot-air oven.
[b] Resin contained 2 parts of divinylbenzene per 100 parts of 60/40 blend. Laminates were cured for ½ hr. at 300° F. and ½ hr. at 320° F. in mold. Post-cure was for 2 hr. at 350° F.
[c] One percent of vinyl triethoxysilane was dissolved in the 50/50 blend and 1% of A-172 vinyl silane in the 60/40 blend.

since each group consists of two carbon atoms. In our studies, when using an all-hydrocarbon resin and curing in the 300° F. range, use of the ethyl silane results in laminates inferior to those obtained when the vinyl is used. However, use of the ethyl silane results in a definite improvement over the use of no silane, particularly in water resistance. The solubility properties of the ethyl and vinyl groups can be considered substantially equivalent.

Before discussing further the bond that one may get between a resin and a silane finish on glass, let us consider the adhesion of the silane to the glass. Is it not possible that under certain conditions the coupling to the glass may be weaker than that to the resin?

It is reported that when glass is exposed to air of 100% humidity, adsorbed films as thick as 183 molecular layers of water have been measured(11). As is well-known, glass holds a film of moisture very tenaciously and exposing glass to a temperature of 212° F. under a high vacuum for hours fails to remove it even to a monomolecular film. It is safe to say that when glass fibers are treated with a silane, the silane does not react with the glass, but rather with the water on the surface of the glass. Apparently, it has to be this way. Rochow(12) reports that if glass is baked at 570° F. under high vacuum prior to treatment with a gaseous alkyl trichlorosilane, no reaction results. This would indicate that vinyl trichlorosilane will not react with the glass surface itself.

Thus, the vinyl silane does not tie on to the glass surface via the chloride or hydroxyl groups with the vinyl group projecting into the resin phase as is often pictured, but rather it is in the form of a siloxane which is separated from the glass surface by a film of moisture. In the case of a glass fiber the siloxane sheath should act as a tube over a rod with a small annulus filled with moisture separating the two. When the silane is applied to the fiber glass as the silanol, as is the practice in industry, the thickness of this moisture film on the glass should be a maximum. Once the extraneous water is removed by drying and the silanols condensed to siloxane sheaths around each fiber, the water is trapped in the annulus. The well-known property of siloxanes to repel moisture should work just as well in reverse, i.e., to hold the moisture trapped on the glass surface substantially intact. If this picture is correct, the force to break the bond of coupling agent to glass would be quite different if the glass is in the form of a fiber as compared to a flat surface. It would also be different if the stress were applied parallel to the axis of the fiber as compared to that at an angle.

As shown by the data in Table I, a very appreciable improvement is obtained when the polyester is cured with dicumene peroxide (Dicup) catalyst as compared to benzoyl peroxide (BPO). This is not a matter of temperature, since in the second example with BPO, the post-cure was as severe as that with Dicup. However, a slow-polymerizing monomer is more likely to polymerize when using a catalyst that is active in a higher temperature range as compared to one that gives up its free radicals at a lower temperature. Thus, the improvements obtained with Dicup as compared to BPO are believed to be due to a more complete reaction of the vinyl silane coupling agent when using the Dicup. The improvements are thought to be a matter of degree rather than of kind for the following reasons:

1) Even with the use of Dicup, all of the available vinyl groups may not copolymerize.

2) Of the vinyl groups that do polymerize, it is likely that they are combined into **(To page 198)**

# 10 BRIGHT COLORS

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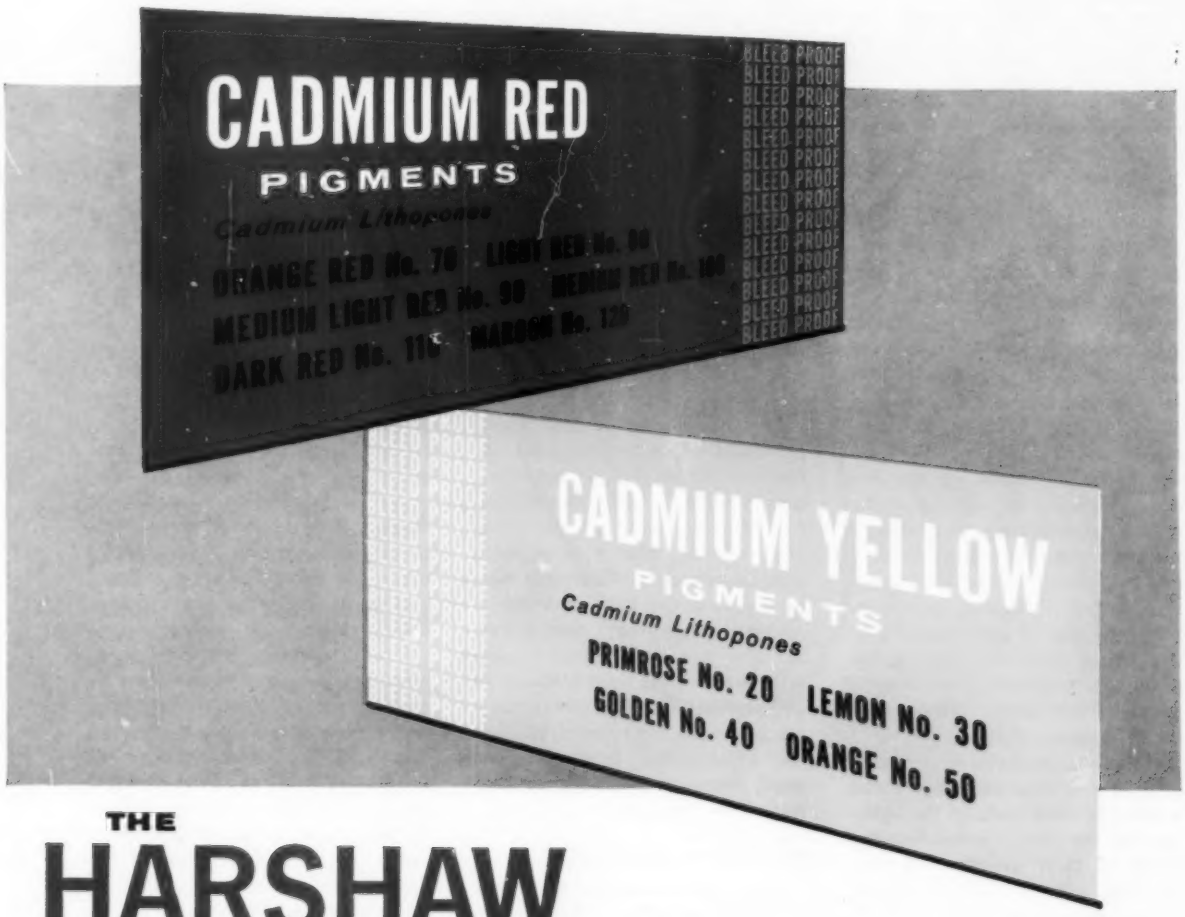


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# Polystyrene for lighting fixture use

By P. H. Estes*, E. R. Smith*, P. C. Woodland*, and E. W Veazey*

Polystyrene is a useful material in the important field of lighting fixtures. However, it must be stabilized to prevent yellowing when exposed to fluorescent lamp radiation. Ultra-violet stabilizers and antioxidants incorporated in the polystyrene formulation protect against discoloration, but an accelerated test is needed to predict accurately their efficiency in a given formulation. It is shown that the Fadeometer is the most accurate accelerated testing device to predict the useful life of a light-stabilized polystyrene in a fluorescent lighting fixture.

The advent of polystyrene (PS) as an important plastic and of fluorescent lamps as an important light source came about in the late 1930's. In the ensuing 20 years, many improvements and modifications of polystyrene have been made so that the material would better answer environmental lighting demands. In plastic lighting fixtures, polystyrene has afforded low cost, good dimensional stability, extremely low moisture absorption, and adequate heat resistance. However, polystyrene lacked another important property, that of light stability to fluorescent radiation. Polystyrene gradually yellowed and showed definite discoloration when placed under fluorescent lights.

Intensive cooperative research programs to upgrade polystyrene were conducted both by the lighting and the plastic industries; the result of these programs is seen in the quality light-stabilized polystyrene now available. At Dow this work resulted in the recent announcement of improved light-stabilized Styron 672 Verelite and Styron 673 Verelite.

In 1947 a Plastics For Lighting committee was formed under the auspices of leaders in both industries. By 1954 a *Property Specification For Polystyrene Used In Fluorescent Lighting Fixtures was adopted.*[1] Industry-wide use of this specification has minimized misapplications and faulty designs and has led to the mass production of polystyrene lighting fixtures suitable for use under fluorescent light.

To produce a satisfactory light-stabilized polystyrene and to fabricate it correctly, many factors must be taken into consideration. Three of the most important are knowing what causes polystyrene to yellow; knowing how to evaluate the light stability of a given polystyrene; and knowing how various fabrication conditions affect the light stability of polystyrene. The first two of these are primarily the responsibility of the polystyrene producer. The third, however, is the responsibility of the fabricator.

### Why polystyrene yellows

Many environmental influences affect the yellowing rate of polystyrene. Oxygen is one of the most active influences in this process. Oxygen is just as important to the yellowing of PS as it is to the rusting of iron.

The effect of oxygen on polystyrene is catalyzed by light radiation. The precise roles of oxygen and light radiation have been determined in a simple, but effective, test. Identical samples of polystyrene were sealed in Pyrex test tubes containing different gaseous atmospheres and exposed to sunlight. Samples in test tubes containing nitrogen and other inert gases showed negligible discoloration, even after 6 year's exposure. In light with oxygen or air in the tubes, pronounced yellowing occurred. Samples stored in the dark did not yellow even though oxygen was present. Since only samples exposed to oxygen and light yellowed, it is easy to see the contribution of light and oxygen to the yellowing process.

Obviously, to keep polystyrene from yellowing in the presence of light, something has to be done to keep oxygen away from the polystyrene molecules. To do this, antioxidants and/or ultra-violet screeners are incorporated in polystyrene formulations. Antioxidants combine with free oxygen and the oxygen is no longer available to degrade the polystyrene.

Ultra-violet screeners act in a more subtle way. The bonding of oxygen onto the polystyrene molecule is speeded up by radiation in the ultra-violet portion of the spectrum. Ultra-violet screeners absorb these same rays. Polystyrene containing antioxidants and/or ultra-violet screeners is the light-stabilized polystyrene that is successfully used in lighting fixtures.

### The radiation spectrum

There are many antioxidants and UV screeners, all of which act with varying degrees of success in stabilizing polystyrene formulations. To quickly and efficiently determine the functionality of these different materials, an accelerated test is needed. Un-

*Plastics Dept., The Dow Chemical Co.
Paper presented at the Pacific S.P.I. Conference, March 25-27, 1959.

[1]See p. 142 for latest edition of this standard.

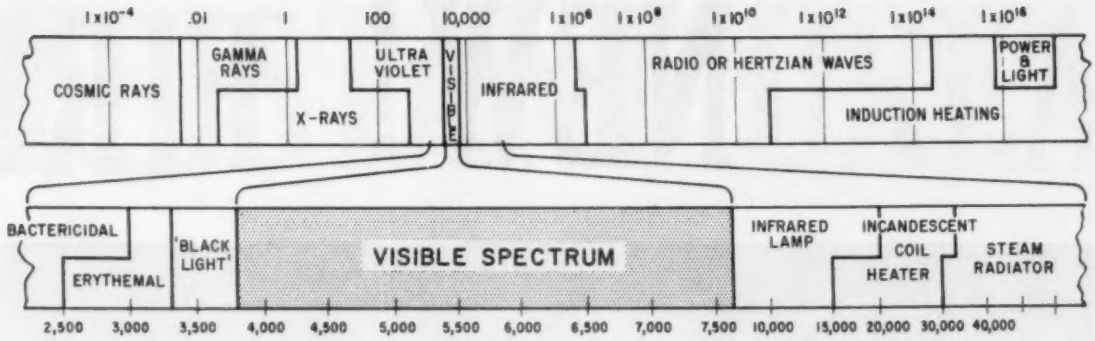



**FIG. 1:** Electromagnetic spectrum.

fortunately, almost as many testing devices as formulations are available. To decide which of the devices is best requires knowing exactly what radiation emitted from fluorescent tubes is most responsible for exciting oxygen attack and contributing to polystyrene degradation.

In Fig. 1, above, a large portion of the electromagnetic spectrum is shown. The extreme left or lower portion of this spectrum represents cosmic ray radiation. For the purpose of this article, these rays can be left to the space scientists and their satellite program. The upper end of the spectrum covers induction heating radiation and also may be ignored. The very narrow visible range and the immediately adjacent radiation bands are the only portions that are pertinent because these are the areas of radiation that are emitted by standard fluorescent lamps. The human eye is sensitive to wavelengths between 4000 and 7000 A., with particular sensitivity to the middle portion of this range. The infra-red portion is of importance only because the heat of such radiation may distort or deform polystyrene. The ultra-violet range, on the other hand, is the radiation that causes most of the yellowing of polystyrene.

The ultra-violet radiation area is broken up into three component parts. The black light portion or the upper end of the ultra-violet area is the lowest wavelength radiation emitted from a fluorescent tube. Below the black light range is the erythemal range or the range between 3000 and 3500 A. This is the radiation that produces a suntan. The third ultra-violet region, the lowest, is the bactericidal range. Radiation within this range can produce ozone, a highly reactive form of oxygen. Any radiation would severely degrade polystyrene.

### Fluorescent lamp radiation

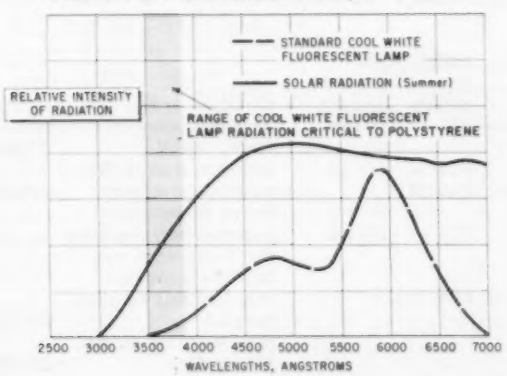
The radiation from the sun at the earth's surface and from a standard 40-w. fluorescent lamp are compared in Fig. 2, below. The curve for sun radiation represents only relative intensity distribution. Sun radiation is too powerful to plot on the same scale with fluorescent light radiation. Note that although the sun has a high output in the visible range, it also has considerable output below that of a fluorescent lamp. That is why a person can be sunburned by the sun but not by a fluorescent lamp. That is also why the sun yellows unstabilized polystyrene so efficiently.

In tests made to determine what fluorescent light radiation is most damaging, certain portions of the radiation spectrum were filtered out. The first filter passed all of the ultra-violet radiation above 2850 A. In Fadeometer exposures with this filter, the yellowing factor[2] was 4.5 after 200 hours. In outdoor exposures for 5 mo. (522 UV sun hr.) while using the same filter, the yellowing factor was 10. **(To page 138)**

[2] $\text{Yellowing factor} = \frac{(T_{420}\text{ unexposed} - T_{420}\text{ exposed}) - (T_{680}\text{ unexposed} - T_{680}\text{ exposed})}{T_{680}\text{ unexposed}} 100$

where $T_{420}$ = percent transmission at 420 mμ wavelength, etc., for specimens of equal thickness.

**FIG. 2:** Comparison of radiation from the sun and from a white fluorescent lamp.



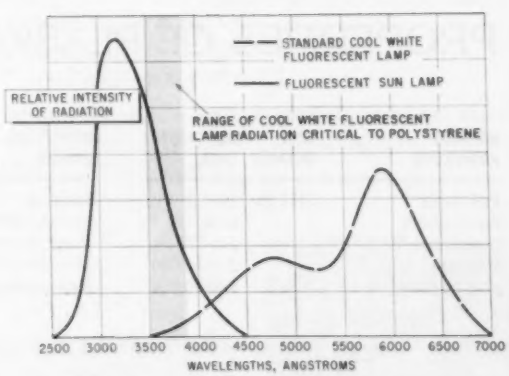
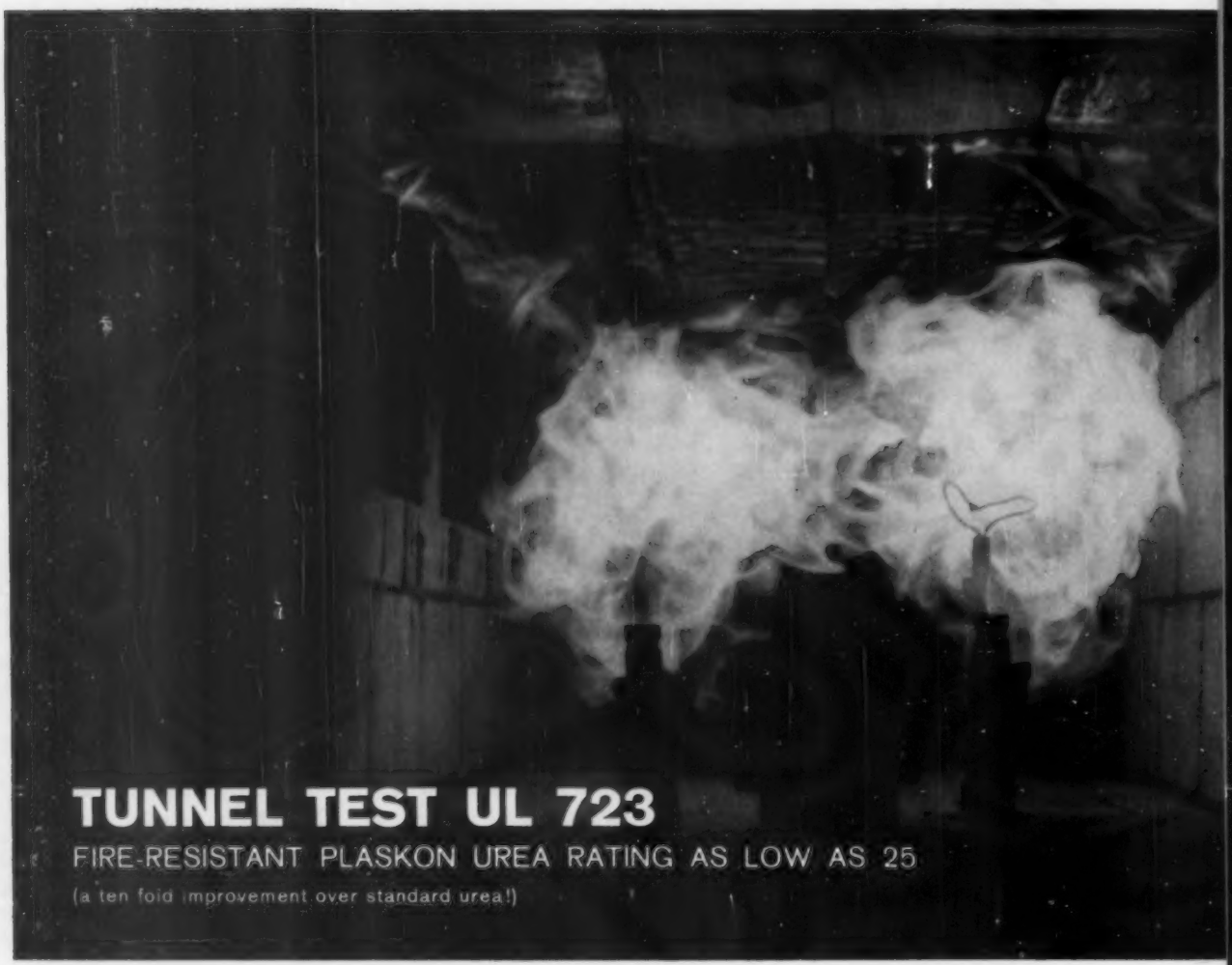




**FIG. 3:** Output of a fluorescent sun lamp compared to standard cool white fluorescent lamp.

# NEW! FIRE-




## PROPERTIES OF PLASKON FIRE-RESISTANT UREA UFR-28:

| MOLDING PROPERTIES | ASTM TEST METHOD | FIRE-RESISTANT UREA |
|---|---|---|
| Bulk Factor | D392-38 | 2.4-3.0 |
| Preformability | | Good |
| Temperature, F | | 275-325 |
| Pressure | | 2,000-8,000 |
| Mold Shrinkage, in/in | | 0.006-0.014 |

| PROPERTIES MOLDED | ASTM TEST METHOD | FIRE-RESISTANT UREA |
|---|---|---|
| Electrical | | |
| Arc Resistance, sec. | D495-58T | 110-130 |
| Dielectric Strength, v/mil | D149-55T | |
| Short time, ⅛ inch | | 300-400 |
| Step-by-step, ⅛ inch | | 200-300 |

| PHYSICAL | ASTM TEST METHOD | FIRE-RESISTANT UREA |
|---|---|---|
| Specific Gravity | D792-50 | 1.47-1.52 |
| Coefficient of Linear Thermal Expansion/deg C, max. | D696-44 | $2.7 \times 10^{-5}$ |
| Thermal Conductivity, g-cal/(sec) (cm²) (deg C/cm) | | $7.8 \times 10^{-4}$ |
| Heat Resistance, F, max. | | 170 |
| Deflection Temperature under Load (Heat distortion), 264 psi, F | D648-56 | 245 |
| Water Absorption, per cent, 24 hr @ 25 C | D570-42 | 0.5-0.7 |

# RESISTANT UREA

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**A.S.T.M. Test D635-56T**
RATING: NON-BURNING

| MECHANICAL | ASTM TEST METHOD | FIRE-RESISTANT UREA |
|---|---|---|
| Impact Strength | | |
| Izod ft-lb/in. of notch | D256-56 | 0.25-0.35 |
| Flexural Strength, psi | D790-58T | 10,000-16,000 |
| Tensile Strength, psi | D638-58T | 5,000-10,000 |
| Rockwell Hardness | D785-51 | M116-M120 |

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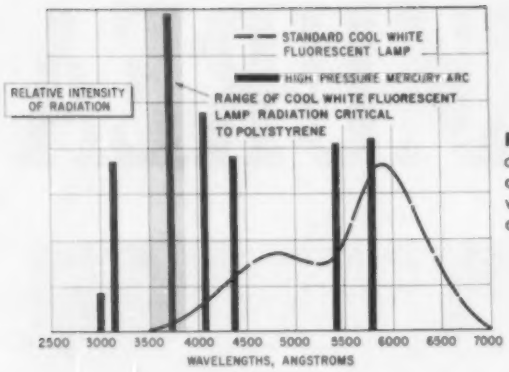
STANDARD COOL WHITE FLUORESCENT LAMP
HIGH PRESSURE MERCURY ARC
RELATIVE INTENSITY OF RADIATION
RANGE OF COOL WHITE FLUORESCENT LAMP RADIATION CRITICAL TO POLYSTYRENE
2500 3000 3500 4000 4500 5000 5500 6000 6500 7000
WAVELENGTHS, ANGSTROMS

**FIG. 4:** Radiation curve of a high-pressure mercury lamp compared with standard fluorescent lamp.

With the second filter, all radiation above 3750 A. was passed. This meant that most of the ultra-violet radiation *was filtered out*. The yellowing factor dropped to an identical 0.5 in both exposures, indicating that the samples had yellowed very little. Therefore, it is possible to conclude that ultra-violet radiation, solar or Fadeometer, is the major cause of polystyrene yellowing. As a further check, a third filter screening out all radiation below 4250 Angstroms was used. The yellowing factors were 0 to 0.5 for Fadeometer and sunlight, respectively.

As a result of these tests, the area between 3500 and 3800 A. is recognized as being most critical in fluorescent lamp radiation and is shaded in Fig. 2 and all subsequent figures. Note that the shaded area covers only the lower portion of the fluorescent tube radiation. This is the radiation that must be intensified by an accelerated testing device if long term stability of polystyrene to fluorescent lamp radiation is to be predicted accurately.

### Evaluating light stability

Various light sources have been suggested for use in accelerated testing devices for polystyrene. A comparison of the radiation curves for these light sources will show which provides peak radiation between 3500 and 3700 A. and, has best utility in evaluating light-stabilized polystyrene.

*Fluorescent sun lamp.* Figure 3, p. 135, shows the output of a fluorescent sun lamp compared to a standard cool white fluorescent lamp. The majority of fluorescent sun lamp emission falls in the erythemal range between 3000 and 3500 A. This produces suntan as was the desire of the people engineering the fluorescent sun lamp. It will also turn PS yellow.

*Mercury arc radiation.* Figure 4, above, shows the radiation curve of a high-pressure mercury lamp compared with that of a standard fluorescent lamp. The output from the high-pressure mercury lamp is in the form of narrow bands and not a continuous spectrum. The band shown at 3750 A. is ideally located in the critical radiation area. However, mercury lamp radiation occurs simultaneously at all the peaks shown. Therefore, the extreme degradation caused by radiation at the 3000 and 3200 A. levels must be taken into consideration. The mercury lamp, as the fluorescent sun lamp, does a good job of yellowing polystyrene without accurately relating this to yellowing caused by cool white fluorescent lamp radiation.

*Fadeometer radiation.* The radiation from an Atlas Fadeometer and that of a cool white fluorescent lamp are both compared in Fig. 5, below. The Fadeometer has a continuous output of radiation in the area of the most harmful radiation given off by a cool white fluorescent lamp. Particularly noteworthy is the fact that the Fadeometer, in contrast to other testing devices, has minimal radiation in the lower ultra-violet region. This accelerated test instrument comes closest to duplicating the type of yellowing caused by fluorescent lamps. With it, the stability of any material to fluorescent lamp exposure can be accurately predicted.

Table I, p. 140, shows a comparison of unstabilized polystyrene and Styron Verelite exposed in the Fadeometer for 100, 200, and 500 hours. The unstabilized sample shows a gradual increase in yellowness up to 200 hr. with a rapid, almost autocatalytic surge to a yellowing factor of 26 at 500 hours. In sharp contrast, the stabilized sample remains practically unchanged through 500 hr. exposure. Here the Fadeometer is predicting a marked improvement in the stabilized material over the unstabilized specimen. Further, the light-stabilized polystyrene should be perfectly adequate for long term service in fluorescent light fixtures.

How these predictions are borne out in the ultimate test—actual exposure to a fluorescent lamp under end use conditions—is shown in Table II, p. 140. Samples of the same stabilized material were exposed continuously to standard cool white 40-w. fluorescent lamps at lamp-to-specimen distances ranging from ½ to 3 inches. The changes in yellowness after 1-yr. (8760 hr.) continuous exposure is practically negligible as is the change after 2 yr. (17,520 hr.). Even in the most severe

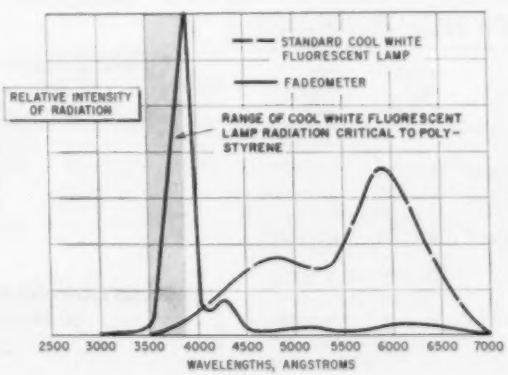
STANDARD COOL WHITE FLUORESCENT LAMP
FADEOMETER
RELATIVE INTENSITY OF RADIATION
RANGE OF COOL WHITE FLUORESCENT LAMP RADIATION CRITICAL TO POLYSTYRENE
2500 3000 3500 4000 4500 5000 5500 6000 6500 7000
WAVELENGTHS, ANGSTROMS

**FIG. 5:** Comparison of radiation from Atlas Fadeometer and cool white fluorescent lamp.

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**Table I:** Fadeometer exposure data for polystyrene (PS)

| Time in Fadeometer hour | Yellowing factor | |
|---|---|---|
| | Unstabilized PS | Stabilized PS |
| 100 | 1.1 | 0.0 |
| 200 | 4.5 | 0.4 |
| 500 | 26.0 | 1.0 |

**Table II:** Styron Verelite after it has been exposed to standard cool white 40-w. bulb

| Distance from sample to bulb in. | Yellowing factor after exposure | | |
|---|---|---|---|
| | 12 months | 24 months | 36 months |
| ½ | 0.9 | 1.4 | 4.5 |
| 1 | 0.3 | 0.9 | 2.0 |
| 1½ | 0.0 | 0.3 | 1.7 |
| 3 | 0.0 | 0.0 | 0.6 |

case of the ½ in. lamp-to-specimen distance, the color has shifted very little. From this it is possible to conclude that light-stabilized polystyrene will very adequately pass the present SPI-IES specification and give an optimum long use life in final applications.

### Fabrication conditions

*Effect of short chain molecules and volatiles:* Up to this point the effects of fluorescent lamp radiation on polystyrene have been our only concern. Two other factors also play an important role in the yellowing of polystyrene. These are the number of short chain molecules and the amount of volatiles present in the polystyrene formulation.

Short chain molecules, called dimers and trimers, are produced by the thermal and mechanical forces engendered during fabrication. Short chain molecules produced by the thermal degradation process are extremely yellow. Not only will these dimers and trimers increase the yellowing rate of polystyrene but they will impart an initial yellow cast to the lighting fixture. Another disadvantage to the presence of short chain molecules is that they significantly lower the physical strength of a fabricated part.

The majority of the volatile content in polystyrene is either the internal or external lubricants added for easier fabrication. Such lubricants degrade or yellow readily upon exposure to fluorescent light radiation. Therefore, easy-flow materials formulated solely by the addition of lubricants will ordinarily yellow faster than stiffer flowing materials containing less lubricant.

*Fabrication effects:* Thermal degradation of polystyrene during fabrication is dependent on both fabrication temperatures and fabrication inventory time. Actually, these two factors are interrelated, as fabrication temperatures are increased, the allowable fabrication inventory time is reduced. In other words, light-stabilized polystyrene can be degraded by exposure to excessively high cylinder temperatures for short periods, or by prolonged exposure to what may ordinarily be considered normal operating temperatures. To illustrate the effects of fabrication conditions on the useful life of Styron Verelite, extrusion tests were conducted over a wide range of stock or extrudate temperatures. Parts were extruded at stock temperatures of 360 to 440° F. All parts extruded over this temperature range had identical yellowing. **(To page 204)**

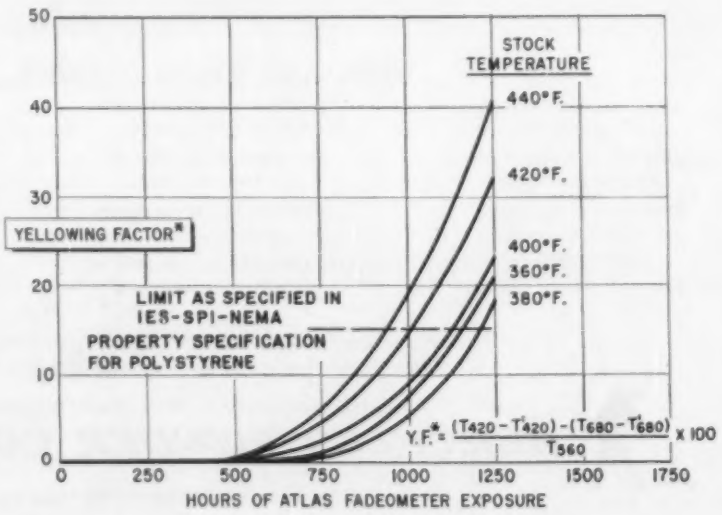
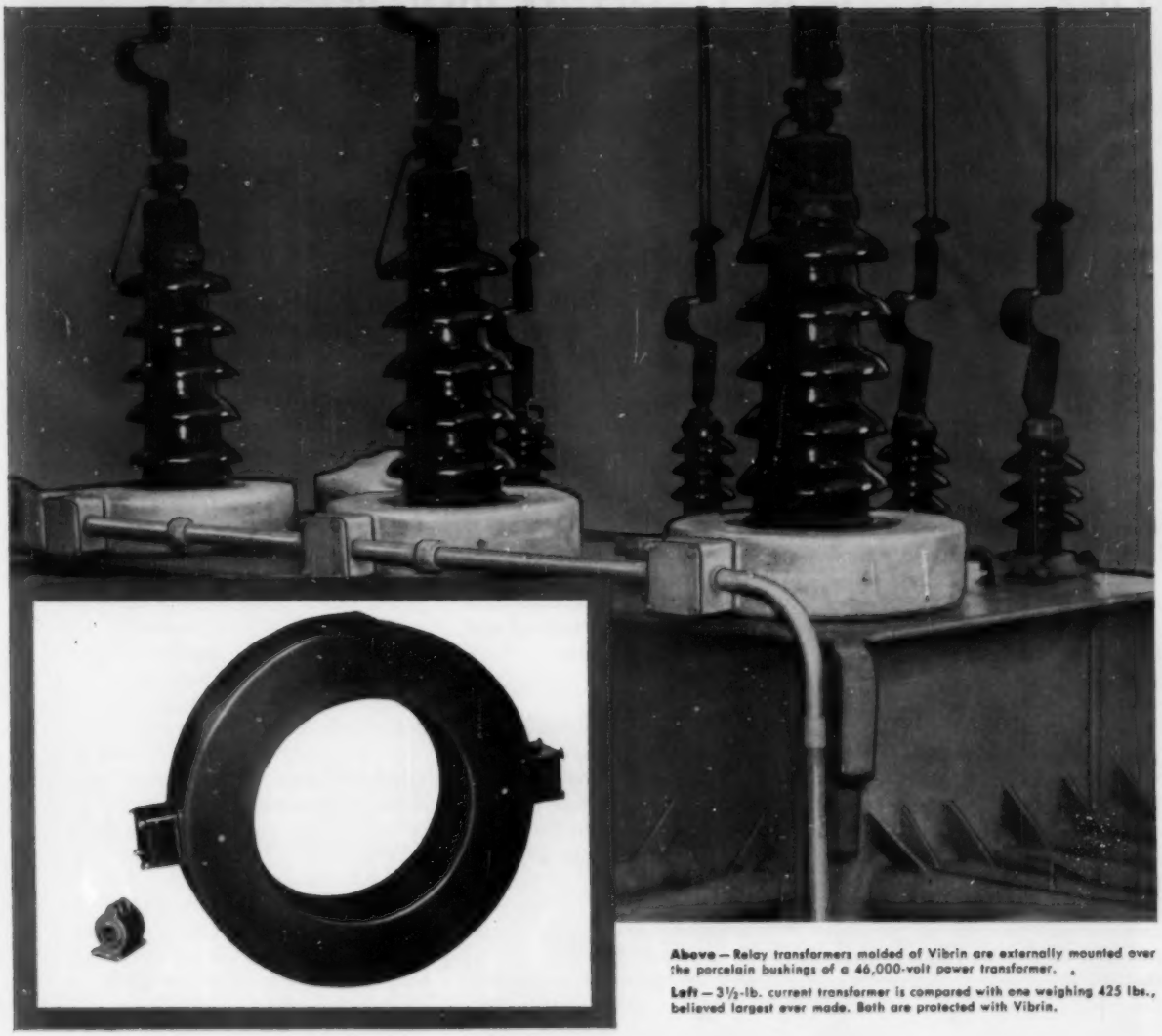



FIG. 6: Effects of extrusion conditions on light stability of light stabilized polystyrene. Little yellowing occurred in the initial 500 hr. exposure.

# Naugatuck VIBRIN



**Above**—Relay transformers molded of Vibrin are externally mounted over the porcelain bushings of a 46,000-volt power transformer.

**Left**—3½-lb. current transformer is compared with one weighing 425 lbs., believed largest ever made. Both are protected with Vibrin.

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# Recommended light characteristics of polystyrene used in illumination

The use of plastic as an important function of light control is widely accepted in the lighting industry. Because of the acceptance and wide use there has been a continual demand for accurate correlation of data on the various plastics as a light control medium and also data on predicted maintenance and life. Several years ago, the activity of the I.E.S. Light Control and Equipment Design Committee was extended to investigate methods of providing members of the Illuminating Engineering Society with adequate information.

A subcommittee was formed composed of members of the I.E.S., The Society of the Plastics Industry, Inc., and the National Electrical Manufacturers Assn. Early studies had determined that the problem was threefold: first, to establish measuring methods and terminology acceptable to both the plastics and lighting industry; second, to recommend light characteristics for various plastics so that correlation of measurable data would be made from materials conforming to basic recommendations; and, third, to determine and correlate data that are applicable to the prediction of the behavior of plastics in lighting luminaires.

The material first chosen was polystyrene. This is to be followed by acrylics, vinyls, and polyethylene. The first report, "Recommended Light Characteristics of Polystyrene Used in Illumination," provides recommendations for the lighting industry to provide a material with predictable test results.

The primary responsibilty of the I.E.S. representatives has been to furnish the leadership in covering the illuminating qualities, while The Society of the Plastics Industry and the National Electrical Manufacturers Assn. developed mechanical and physical characteristics.

A standard prepared by the I.E.S.-S.P.I.-N.E.M.A. Subcommittee of the I.E.S. Light Control and Equipment Design Committee. Approved by the Council of the Illuminating Engineering Society, February 1958. This standard is reprinted in MODERN PLASTICS through the courtesy of the Illuminating Engineering Society.

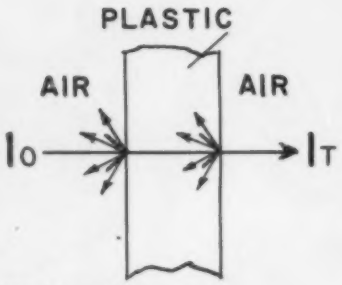


**FIG. 1:** Definition of regular transmission. $I_T$ is regular light transmission where $I_O$ is incident light.

### Scope

These recommendations for light characteristics serve to identify and to characterize thermoplastic polystyrene compounds for use, particularly in the manufacture of fluorescent light diffusing luminaires. Factors of fabricated luminaire design and performance are considered beyond the scope of this recommendation.

These recommendations cover the following three types of polystyrene compounds:

*Class A*—Unmodified polystyrene with or without the addition of diffusing pigments and small amounts of lubricants.

*Class B*—Essentially Class A material characterized by improved heat distortion properties.

*Class C*—Essentially, polystyrene with or without the addition of diffusing pigments and incorporating additives to inhibit discoloration resulting from fluorescent light radiation.

### General requirements

In order to test check the lighting performance: 1) the compound should be of uniform composition and so compounded as to conform to the requirements in these recommendations. 2) Samples of the original color match should be submitted to the user for approval of color; and they should be representative of subsequent supply.

### Detail requirements

In order to insure that the test specimen shall be representative for checking illumination performance they should be injection molded under **(To page 206)**

**Table I:** Requirements of test specimens

| | *ASTM test method*[a] | *Class* A | B | C |
|---|---|---|---|---|
| Specific gravity, min. (Method A) | D792 | 1.045 | 1.045 | 1.045 |
| Tensile strength, min., p.s.i. | D638 | 6,000 | 7,000 | 6,000 |
| Elongation in 2 in., min., % | D638 | 1.0 | 1.0 | 1.0 |
| Impact strength, min., ft./lb./in. of notch | D256 | 0.25 | 0.25 | 0.25 |
| Heat distortion temperature, min., °F. ½ by ⅛ by 5 in. specimen, 264 p.s.i. fiber stress | D648 | 165 | 176 | 165 |
| Burning rate, in. per min., max. | D635 | 2 | 2 | 2 |

[a]May be obtained from the American Society for Testing Materials, 1916 Race St., Philadelphia, Pa.

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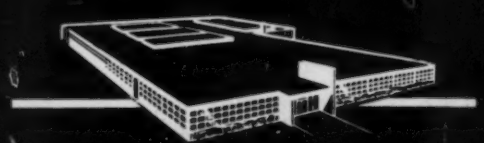

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# Plastics production in 1958

***Data* on poundage and unit values of plastics and resin materials produced in the United States during 1958, grouped by chemical composition***

| *Material* | *Production[a] 1000 lb.* | *Unit value per lb.[b] dollars* |
|---|---|---|
| **Grand total** | **4,658,987** | |
| BENZENOID RESINS | | |
| **Total** | **2,102,506** | **0.27** |
| **Coumarone-indene and petroleum polymer resins** | **267,940** | **.10** |
| **Epoxy resins:** | | |
| Unmodified (condensation products of phenol and derivatives with epoxy compounds) | 33,911 | .64 |
| Modified (with hardening agents and esterified with fatty acids) | 7,357 | .63 |
| **Phenolic and other tar acid resins, total** | **487,862** | **.27** |
| **Unmodified, total** | **449,570** | **.26** |
| Cresols-formaldehyde | 5,649 | .37 |
| Cresylic acid-formaldehyde | 7,880 | — |
| Phenol- (and substituted phenol)- formaldehyde | 409,233 | .26 |
| Resorcinol-formaldehyde | 1,135 | .90 |
| All other | 25,673 | .29 |
| **Modified, total** | **38,292** | **.29** |
| Phenol- (and substituted phenols)- formaldehyde with modifiers (except rosin) | 10,165 | .30 |
| Rosin and rosin esters modified with phenolic and other tar acid resins (hard resins) | 22,571 | .23 |
| All other | 5,556 | .46 |
| **Phthalic alkyd resins, total** | **416,837** | **.31** |
| Unmodified | 305,550 | .30 |
| Modified | 111,287 | .32 |
| **Polyester resins[c]** | **117,246** | **.38** |
| **Styrene resins, total** | **763,057** | **0.28** |
| Polystyrene | 474,417 | .25 |
| Styrene-acrylonitrile copolymer | 20,716 | .39 |
| Styrene-alkyd polyesters (for protective coatings only) | 24,364 | .40 |
| Styrene-butadiene copolymer (containing 50% or more styrene), total | 176,855 | .31 |
| Latexes | 119,270 | .28 |
| Other | 57,585 | .38 |
| Styrene-divinylbenzene copolymer | 25,303 | .45 |
| All other styrene resins | 41,402 | .26 |
| **All other benzenoid resins[d]** | **8,296** | **.62** |
| NONBENZENOID RESINS | | |
| **Total** | **2,415,122** | **.35** |
| **Alkyd resins, except phthalic, total** | **85,753** | **.30** |
| **Unmodified** | **34,986** | **.38** |
| **Modified, total** | **50,767** | **.22** |
| Rosin and rosin esters, modified with maleic and fumaric acids only (hard resins) | 47,437 | .21 |
| All other | 3,330 | .39 |
| **Polyethylene resins, total** | **864,728** | **.32** |
| High-pressure process | 794,258 | .32 |
| Low-pressure process | 70,470 | .33 |
| **Rosin modifications, total** | **58,889** | **.23** |
| **Rosin and terpene adduct resins** | **4,433** | **.38** |
| **Rosin and rosin esters, unmodified (Ester gums), total** | **48,503** | **.20** |
| Esterified with glycerol | 23,717 | .19 |
| Esterified with other alcohols (methanol, glycols, pentaerythritol, etc.) | 24,786 | .20 |
| **All other** | **5,953** | **.48** |
| **Silicone resins** | **3,097** | **2.88** |
| **Urea and melamine resins, total** | **349,214** | **.30** |
| Urea-formaldehyde type | 238,663 | .22 |
| Melamine-formaldehyde type | 110,551 | .46 |
| **Vinyl and vinyl copolymer resins, total[e]** | **869,419** | **.32** |
| Polyvinyl acetate | 118,498 | .31 |
| Polyvinyl chloride and copolymer resins (containing 50% or more polyvinyl chloride) | 657,177 | .27 |
| All other vinyl resins[f] | 93,744 | .79 |
| **All other nonbenzenoid resins[g]** | **184,022** | **.81** |
| CELLULOSE PLASTICS | | |
| **Total** | **141,359** | **—** |
| **Cellulose acetate and mixed esters:** | | |
| Sheets, continuous, under 0.003 in. gage | 17,036 | — |
| Sheets, continuous, 0.003 in. gage and over | 18,421 | — |
| All other sheets, rods, and tubes (including other cellulose plastics) | 9,193 | — |
| Molding and extrusion materials (including other cellulose plastics) | 93,772 | — |
| **Nitrocellulose sheets, rods, and tubes** | **2,937** | **—** |

*Source: U. S. Tariff Commission.
[a]For the purpose of this report, "dry basis" is defined as the total weight of the material, *including* resin, plasticizers, fillers, extenders, colors, and stabilizers, and *excluding* water, solvents, and other liquid diluents.
[b]Calculated on rounded figures.
[c]Polyester resins, for the purpose of this report, include unsaturated alkyds copolymerized with monomers such as styrene, and polyallyl resins such as diallyl phthalate, and allyl diglycol carbonate. Styrene-alkyd polyesters for protective coatings are included under *Styrene resins*.
[d]Includes data for aniline-formaldehyde, toluenesulfonamide, and other benzenoid resin materials not specifically classified.
[e]Based on resin content only.
[f]Includes data for polyvinyl alcohol, butyral, and formal, and for copolymers containing less than 50% polyvinyl chloride.
[g]Includes data for acrylic, polyamide, and other non-benzenoid resin materials.

DOW **Plastiatrics**

DOW'S CLINICAL APPROACH TO HEALTHY PLASTICS APPLICATION

# STUDY EMPHASIZES ENVIRONMENT AS IMPORTANT FACTOR IN LIMITING DESIGN STRENGTH (PART 2)

(This is the concluding half of a two-part article detailing the importance, and some of the effects, of environment on the performance of plastics materials. Part 1, which appeared in a recent issue of this magazine, was concerned primarily with the roles of design and environment as important, but often neglected, elements of engineering data.)

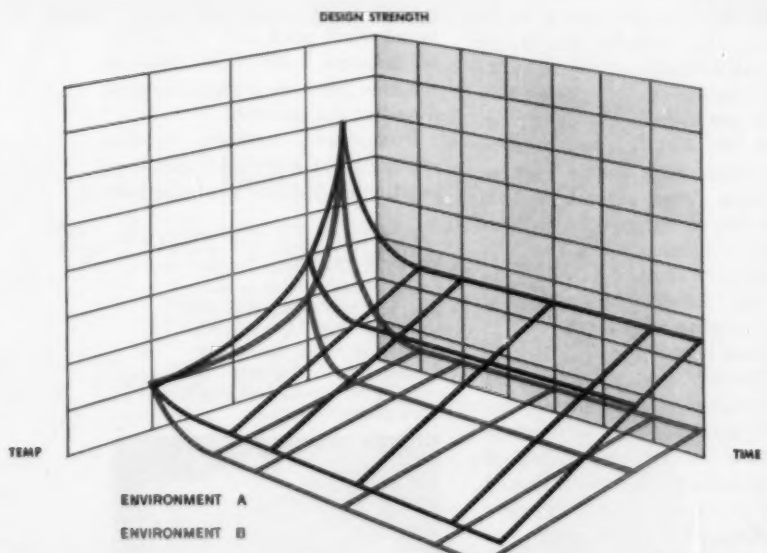
It's well known that environmental effects are commonly found in dealing with such engineering materials as metals, ceramics, and even glass. In these materials, environment sensitivity is often called "stress corrosion" or "stress corrosion cracking", and is frequently characterized by chemical reactions. Comparable failure in plastics is termed "stress cracking", though it is seldom accompanied by failure-induced chemical reactions.

In conducting this series of Plastiatrics studies, Dow Plastics Technical Service Engineers have developed evaluation methods which allow determination of environmental effects on design strength. The methods take into account time, temperature, environment and stress level; and permit the development of design data of importance to designers and plastics engineers.

It has been pointed out that environmental changes can easily reduce the design strength of plastics—that is, the stress level above which stress cracking occurs—to a point where relatively low stresses will produce failure. When a plastics material retains relatively high strength in a given environment "A", and a second environment "B" is known to reduce that plastic's strength by many times, it is seldom possible to determine the actual degree of weakening except by physical testing. However, both strength-time curves will be similar in shape. And because environmental effects are physico-chemical in nature, both curves will generally follow the rule of chemical activity increasing with temperature.

The relationship of environment to time, temperature and strength is shown by the accompanying graph, data for which was based on a completed Plastiatrics study of a Dow plastics material.

Plastiatrics studies to develop engineering data, and to investigate many phases of plastics formulation, design, molding and finishing are continually in process by Dow Plastics Technical Service Engineers. For further information on these plastiatrics studies, write THE DOW CHEMICAL COMPANY, Midland, Michigan, Plastics Sales Department 2105CS9.




*Strength curves of a plastics material in two different environments will generally be similar in shape, but the relative degree of strength at any specific time-temperature point can, and usually does, vary considerably.*

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# NEW DEVELOPMENTS

**Many minds at work on new ways to use plastics, new designs, and new product concepts offer ideas you can use.**

## Latest lamp shades

Several interesting applications of thermoplastics in lamp shades have recently been announced.

**Vinyl-lined lampshade**

Strength, long life, soft light diffusion, and concealment of the bulb outlines are features of a new lamp shade lined with semi-rigid vinyl. Firestone Plastics Co., Pottstown, Pa., supplies the vinyl in sheets to Sunset Manufacturing Co., Los Angeles, Calif., where pure silk fabric is laminated to the vinyl sheet. The entire lamp, base and shade, ranges in price from $35 to $65.

**Inflatable vinyl lamps**

Inflatable lamps of vinyl film are offered in two models, one of standard film with a plain, the other with an embossed lenticular surface. They are about 15 in. in diameter, weigh only 1 lb., and are easily shipped and stored when deflated. The fabricator, Warede Manufacturing Co. Inc., Hialeah, Fla., selected vinyl for strength, color, and durability. Tests reported by the company indicate that the film would not discolor or overheat from electric bulbs. Suggested retail price for the lamps is $3.98, complete with light plugs and 6-ft. extension cords. Vinyl film is supplied by Union Carbide Plastics Co., Div. of Union Carbide Corp. The embossing roll for the lenticular model is licensed to Union Carbide by L. E. Carpenter & Co., Wharton, N. J.

**HANGING LAMP** of inflatable vinyl film has an embossed lenticular pattern and extension cord.

**Blown PE shades**

Translucent lamp shades, blow molded of polyethylene, combine toughness with light weight. The manufacturer, H. W. Field & Son Ltd., Harold Wood, Essex, England, suggests application of these virtually unbreakable shades in hospitals and schools, where maximum safety is desired. The shades are suitable for lamps up to 100 w., and are available in opal white, pink, yellow, green, and blue. Retail price is 4s. 9d. per shade, about 70¢ in American currency. The high density PE is supplied by British Resin Products Ltd., London, England.

**TRANSLUCENT** lamp shades, blow molded of high-density polyethylene, are suggested for application in hospitals, schools, and similar places.

**Coiled acetate lamps**

Acetate lamps from The Heifetz Co., Clinton, Conn., are made from the Rotaflex process, which involves extrusion of the acetate into long tubing, and coiling of the extrudate around shaped mandrels, where it seals together in a chemical bond. According to the maker, diameter of the tubing and thickness of the tube wall are closely controlled, resulting in greater light transmission. Other features of the lamp are ease of cleaning, durability, light weight, and lustrous finish. Price list for the four models is: $34.50 for an 8-in. aqua cylinder; $37.50 for a 10-in. cafe oval; $69 for a 20-in. white sphere; and $84 for a 29-in. lemon flat. Acetate is supplied by Eastman Chemical Products Inc., Kingsport, Tenn.

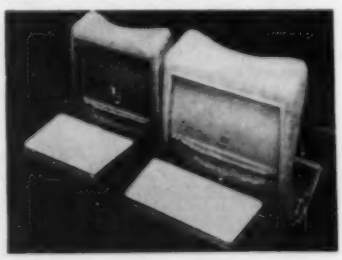
## Foam trays for jets

Fold-down service trays for jet airliners, recessed into seat backs, depend for their strength and light weight on cores of semi-rigid, polyester urethane foam. Made with thin aluminum skins and reinforced with small wooden corner blocks, the trays are currently in use on many American and foreign jets.

The trays were formerly made of aluminum skin-paper honeycomb core sandwiches. According to the tray manufacturer, Mechni-Arts Assocs., Kansas City, Mo., costs of production are about the same with the foam core, but advantages cited are the reduction of overhead because of the elimination of aluminum-honeycomb panel stock piles, and the ending of delivery bottlenecks because the new trays are completely produced at one location.

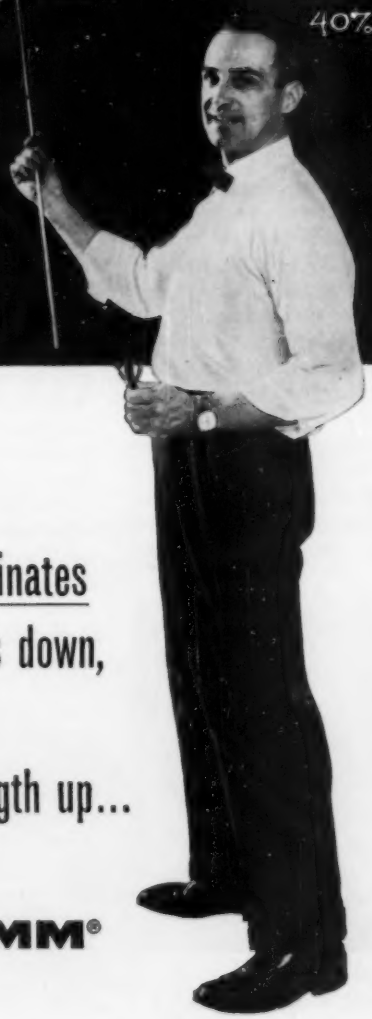
Production methods involve stamping the aluminum sheeting, positioning the four **(To page 148)**

**SERVICE TRAYS** for jet airliner, made of aluminum skin with semi-rigid polyester urethane foam core. Tray at left is used for tourist flights, while the tray at right is in service on first-class accommodations.



# Physical Properties of Polyester Laminate

| | 28.5% Surfex MM | 40% Surfex MM | 50% Surfex MM | 60% Surfex MM |
|---|---|---|---|---|
| Specific Gravity | 1.76 | 1.80 | 1.87 | 1.95 |
| Izod Impact, Ft. Lbs./In. Notch | 14.4 | 16.2 | 17.3 | 16.5 |
| Tensile Strength, psi | 20,300 | 21,300 | 20,100 | 19,300 |
| % Elongation | 1.89 | 1.24 | 2.03 | 1.87 |
| Modulus of Elasticity in Tension, psi x 10° | 1.15 | 1.36 | 1.45 | 1.85 |
| Flexural Strength, psi | 33,150 | 33,600 | 37,800 | 37,000 |
| Modulus of Elasticity in Flexure, psi x 10° | 1.08 | 1.18 | 1.44 | 1.20 |
| Barcol Hardness (10 sec. Reading) | 55 | 57 | 62 | 66 |
| Initial Viscosity of Mix | 1,200 | 2,100 | 3,200 | 5,000 |
| Fiber Glass Mat | 40% | 40% | 33% | 33% |



## New data for Polyester Laminates shows costs down, flexural and impact strength up... with Diamond SURFEX MM®

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Diamond Chemicals

(From page 146)

wooden corner block, taping of aluminum trim strips for screw-fastening later, and the pouring of 130 g. of resin into the assembly. After a 30-min. set, forms are removed, and the trays placed under weights for 12 to 24 hr. to prevent deformation while the foam is curing. The trays are made in two sizes: 10 by 17 in. for first class accommodations; 10 by 14 in. for tourist flights.

Decorative phenolic laminate is glued to the tray top for ease of cleaning. Tray bottoms are covered with felt padding and vinyl sheet to blend with cabin decor when the trays are folded back.

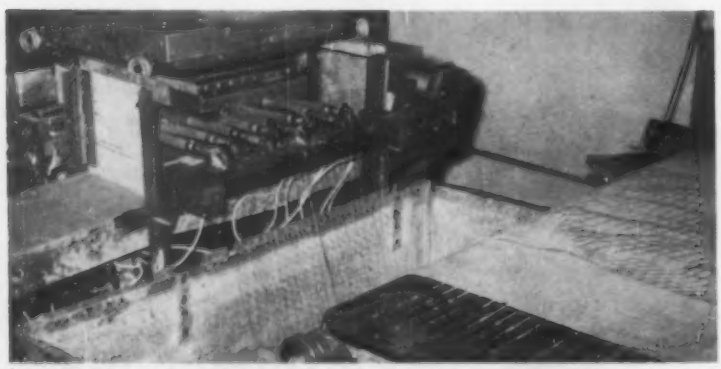
The foam material is supplied by Nopco Chemical Co., North Arlington, N. J.

## One-shot net extrusion

Thermoplastic netting can now be extruded in a single, fully automatic operation. Nalle Plastics, Inc., Austin, Texas, has developed a method of extruding homogeneous net using a Hale & Kullgren 4½-in. extruder with a special die. No details on construction of the die are available. Netting up to 36 in. wide with strand diameters from 0.020 in. up can be made, in various degrees of stiffness, ranging from almost complete rigidity to the consistency of fine tulle.

Vinyl, polyethylene, polypropylene, and even rigid polystyrene have been used. Nalle Plastics thinks vinyl looks especially promising in this area.

A big end use should be wide-meshed bags—nonabsorbent, easy to clean, and available in a wide variety of colors. Window screening of extremely fine mesh is another exciting possibility, and Nalle Plastics is experimenting with different materials in order to obtain maximum strength, light stability, and aging characteristics for this application. Other potentials include rigid baskets and containers, netting balls for scouring pots and pans, and decorator items for the home.



**EXTRUDER** for making netting has special die, flexible tubes to moving parts and complicated drive mechanism; can extrude two-color net.

## PE spray gun head

Designed for use with sprayable liquids not now available in aerosol containers, a new self-contained, self-powered spray gun features a polyethylene head assembly that holds all the working parts together. Tradenamed Jet-Pak, it is made by Sprayon Products, Inc., Cleveland, Ohio.

The spray gun unit consists of a can of liquid propellant gas, a glass jar to house the liquid to be sprayed, and the PE head assembly. Polyethylene was chosen for this application for its relative inertness to the solvents and materials used in the unit, its ease of molding, and its economy.

The propellant gas, liquid dichlorodifluoromethane, has a pressure of 70 p.s.i. at 70° F., which will expand to approximately 700 times its liquid volume when released to the atmosphere. This gas stream, directed across the spray head opening, sucks the liquid up from the glass container, then disperses it into a fine spray as it leaves the nozzle.

**POLYETHYLENE** spray gun head teams up glass jar of sprayable liquid with propellant gas to form a self-contained, self-powered unit.

The plastic head assemblies are molded in four cavity molds on a Reed-Prentice #275 T8-10 machine; shot weight is approximately 5½ ounces. Low density Alathon 20, supplied by Du Pont, is used by the molder, Pyramid Products Co., Cleveland, Ohio.

## Faster styrene foam

Huge blocks of expandable polystyrene are now being produced by a new technique claimed to be 10 to 20 times faster than conventional processes. Smaller molded items can also be made with this production method. Unfortunately, all details are being kept under wrap at the moment; and beyond the fact that "controlled heat and pressures are used," no production data are available.

The foam, expanded from beads of Koppers Dylite, is processed by The Gilman Bros. Co., Gilman, Conn., which markets it under the name of Cellulite. Present applications are in the insulating and packaging fields, seating, and the flotation toy market with a water-play ball. Production is now set at 40 million board feet per year.

For insulation use, Cellulite is made in billets measuring 9 by 4 ft., with a thickness of 16 inches. These billets are then sawed into individual "boards" of any desirable size. For roofing insulation, the foam is tarred, wrapped in a laminated kraft paper, and marketed in a standard 2- by 4-ft. panel. The tech- **(To page 150)**

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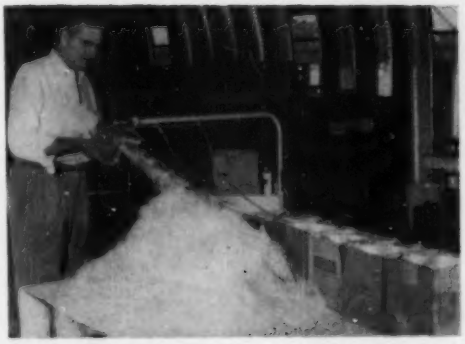

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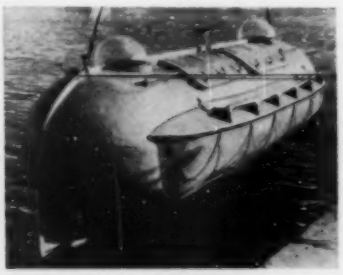
nique is also used for internally contoured shipping cartons.

The foam weighs slightly over 1 lb./cu. ft., has an average K factor of 0.24 at 40° F., and a compressive strength of 10.5 p.s.i.

## Survival gear

**A** completely enclosed lifeboat and a protective container for liferafts, both formed of fibrous glass-reinforced polyester resins, are the latest European entrants in the field of marine survival equipment. (For a similar RP application in this country, see "Plastic lifeboats approved," MPl, Feb. 1959, p. 190.)

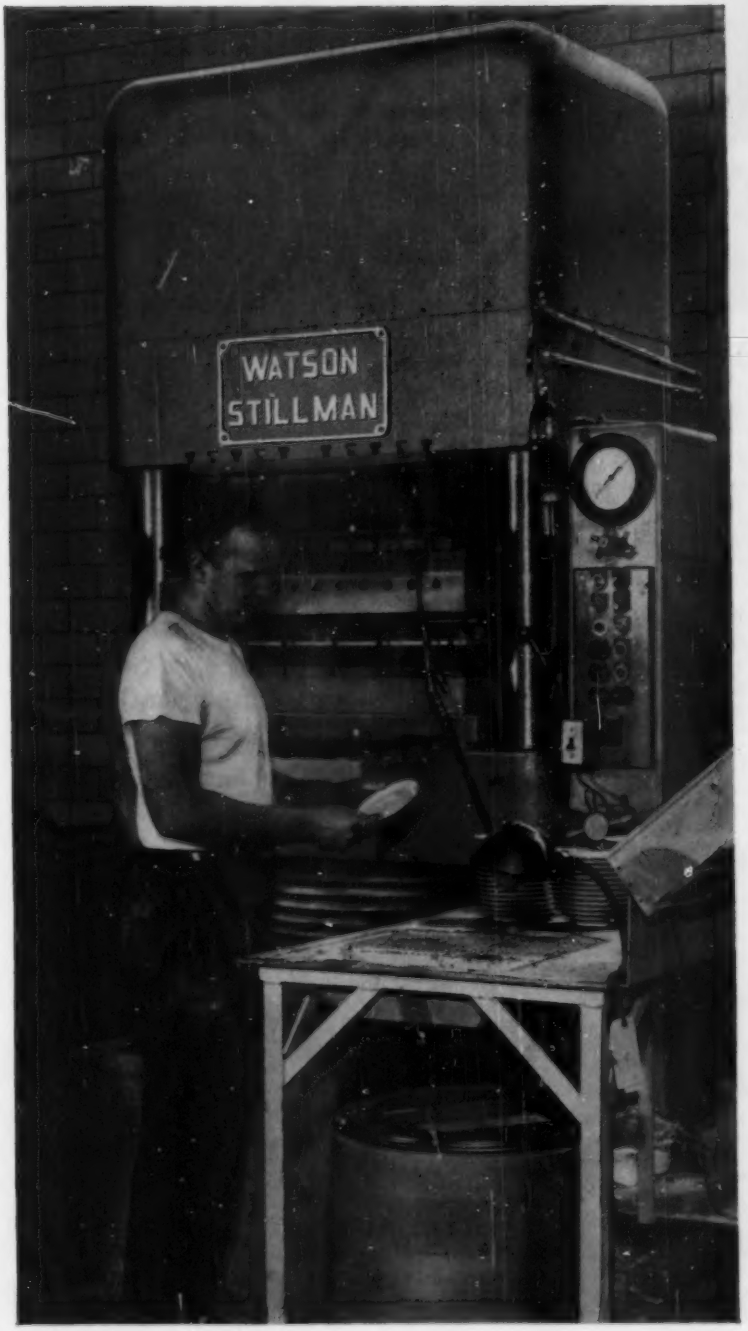
**The German lifeboat** consists of a double hull of glass-reinforced polyester, with rigid polyvinyl chloride foam filling the space between the hulls. Clear acrylic domes at bow and stern provide visibility for lookouts.



**REINFORCED PLASTICS**
German lifeboat (above) and British protective liferaft container (below).

The craft can accommodate 40 passengers and is reported to have excellent strength and buoyancy. It can right itself from any position, and can be handled on deck by conventional davits. It is approximately 26 ft. long and weighs about 3800 pounds. It is equipped with Diesel engine, floating anchor, radio, forced ventilation system, **(To page 152)**

# decorated dinnerware compression molded on specially designed press



Melamine dinnerware is compression molded on a Farrel Watson-Stillman press installed at Applied Plastics Division, Keystone Brass Works, Inc. The finished product, which is both handsome and durable, features molded-in flower and other decorations.

These are obtained through a critical laminating technique which actually seals the designs under the resin film. Multi-cavity molds and 24-hour, 6-day operation of the press are required to meet continuous production demands.

Since this process requires special cycling and infinite control, the press was equipped with a double-cycle control system. The tank and pumping unit were both located in a separate, adjacent room to reduce the possibility of contamination during the molding process. The press has a capacity of 500 tons with operating pressure of 2000 psi. Die-space dimensions are 36" x 30"; stroke is 24".

Farrel Watson-Stillman compression and transfer molding presses are available in standard designs in capacities from 50 to 1200 tons.

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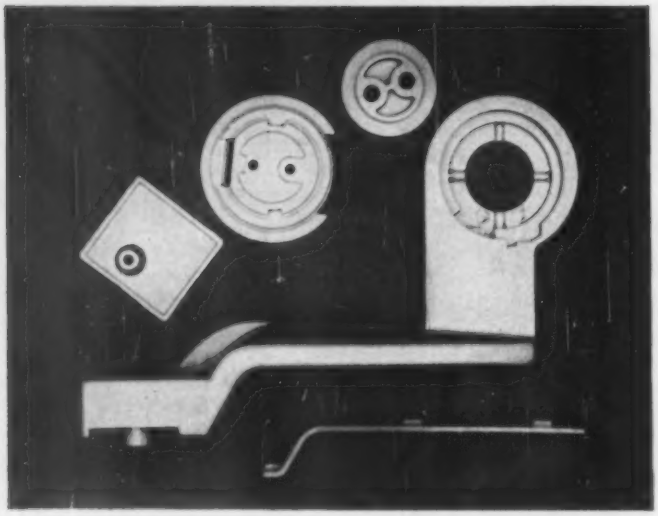

## and got it from CONSOLIDATED

Both dimensional accuracy and fine appearance were essential requirements in the production of this camera flash attachment for Polaroid. Naturally, mold planning and construction were of utmost importance in such a critical job. Precision and timing had to be built into the mold design. Three different molds were necessary to produce the five separate pieces which form one synchronized unit.

In assembling the unit, all parts had to be kept in perfect alignment; no warpage or twist was permitted. For appearance's sake, it was necessary to locate mold parting lines on the natural edges of the pieces.

This flash attachment unit represents the type of molding challenge Consolidated welcomes. We appreciate the opportunity to quote on any molding – complicated or simple.

*The Polaroid Bounce Flash Bracket (Model #292), with swivel-type flash gun clip, permits the taking of both horizontal and vertical pictures without removing the gun to change its position.*

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and complete survival gear. Cost is about $6200, according to manufacturer, Lunewerft G. Kuhr, Hamburg, Germany. Polyester resin is supplied by Reichhold Chemie AG, Hamburg, an associate of Reichhold Chemicals Inc., White Plains, N. Y.

**A British liferaft** container of reinforced plastic, combining complete weather resistance with high impact strength, is said to far outlast canvas containers.

Although specific cost figures are not available, RP containers definitely cost more to produce than canvas equipment. But canvas has a relatively short life under sea-going conditions, and savings with the use of RP containers, result from their longer life and easier maintenance.

The containers, made by Microcell Ltd., Camberley, Surrey, England, come in two lengths, 56 in. for housing 25-man liferafts, and 50 in. for 20-man liferafts; diameter in each case is 24 inches. The cylindrical containers are divided into two halves, held together by a lashing incorporating a hydraulic release mechanism.

Cory Bros. and Co. Ltd., London, and Cardiff, who make the release mechanism, are also marketing the containers. Polyester resins are supplied by Artrite Resins Ltd.

## Channel design for phenolic pan handle

By designing molded phenolic pot handles as a channel section, the component has been made thin enough to permit rapid dissipation of heat, while retaining adequate strength and rigidity. Channel construction also results in light weight and economy of molding material. Air space is provided in the **(To page 154)**

# Why settle for less-than-perfect blending? when you can put CONTROLLED DISPERSION to work for less than $1500.00*

If you combine resins such as vinyls, cellulosics, styrenes, polyesters, polyolefins, etc., with colorants, plasticizers and fillers . . . why settle for less than *complete* dispersion? An investment of only $1475.00 in this ¾ cu. ft. *intensive* mixer may show you how to save four times that much in waste and rejects due to laminations and imperfections.

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If you're coating a fine dry material, blending liquids into a dry powder or dispersing a small amount of one material into a large amount of carrier, you've got a job that takes *more* than a stirring or tumbling action can *give*. Mix-Muller is specifically designed to put you in *control* of these blending properties.

### A SPATULATE ACTION

In the Simpson Mix-Muller you get a unique three-way kneading, smearing, spatulate action which actually coats one material with the other . . . rather than placing them *next* to each other. You get an intensive *controlled* dispersion and a homogenous mix that stays mixed in storage or transit.

### CONSTRUCTION

Spring-loaded mullers permit exact adjustment of pressure to meet material requirements. Dust cover can be quickly adapted for exhaust. Automatic bottom discharge is fast, clean, positive. Unit can be equipped for heating or cooling.

WRITE for a quotation on the LF Mix-Muller, details on a confidential mulling test on your product—or a bulletin describing the *full* line of Simpson Mix-Mullers. They are available in batch capacities of ¾ to 60 cu. ft.

- Unit, ready to go, as above, FOB Chicago .....$1475.00*
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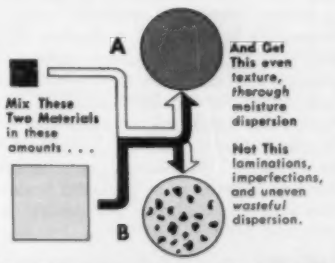
*Prices quoted are for domestic shipment only.*

**Model "LF" Mix-Muller** has capacity of ¼ to ¾ cu. ft. Comes equipped with 1 HP motor and starter, V-belt drive, removable dust hood, crib and muller scrapers, liquid additions funnel, integral base for bench mounting and 4 pipe legs for floor mount. No foundations necessary. Has machined crib and mullers; discharge is automatic, by bottom door.


A
And Get This even texture, thorough moisture dispersion
Mix These Two Materials in these amounts . . .
Not This laminations, imperfections, and uneven wasteful dispersion.
B

**Here's how *controlled mulling* works:**

Diagram shows comparative results of blending a minute amount of one material with large amount of another material in (A) MIX-MULLER and (B) conventional mixer. Savings in raw material, reprocessing time and quality of finished product are the outstanding *rewards* of mulling your product.

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**GOING:** Smearing, *spatulate* action breaks up lumps as mulling action disperses moisture.

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handle's center, with an escape into the open channel area. For added convenience, there is a depressed thumb rest on the top side of the handle.

The handles are molded by the Watertown Mfg. Co., Watertown, Conn., for Enterprise Aluminum Co., Toledo, Ohio, maker of the aluminum pots and pans.

## RP bins hold a ton

Severe material-handling problems in the meat industry have been solved by large fibrous glass-reinforced plastics bins developed by Goodyear Aircraft Corp., Akron, Ohio. These bins measure 4 ft. by 41½ by 36 in. and have

**SMOOTH-SURFACED** RP bins (rear) are in marked contrast to hard-to-clean wooden brine barrels (foreground) formerly used in the meat industry.

a capacity of 33½ cu. ft. or 260 gallons. They weigh only 130 lb. when empty, but are capable of handling or transporting more than a ton of parts or material.

In the meat industry, they have replaced the unsanitary wooden brine barrels, which cost about $45 each. The cost of RP bins ranges from $114 to $125, depending on the length of the legs. However, their service life expectancy is 10 years, many times that of the wooden barrels. Stainless steel bins, which are also used in this application, cost about three times as much as the plastics containers.

The bins consist of an RP body with a separate base, which is bonded on under high heat and pressure. Lined on the inside with a fine texture mat **(To page 156)**

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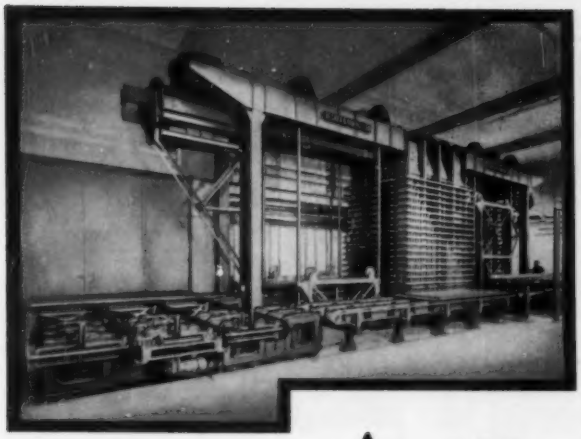

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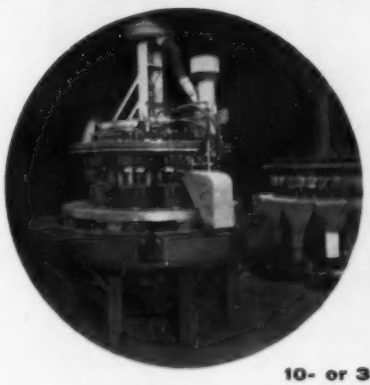

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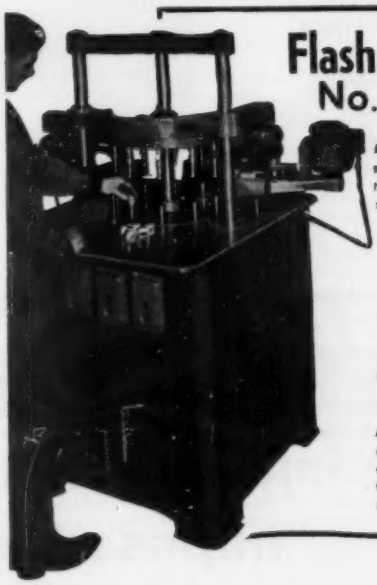

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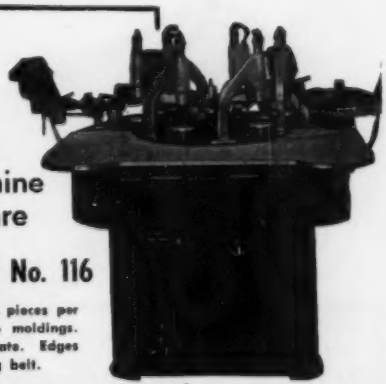

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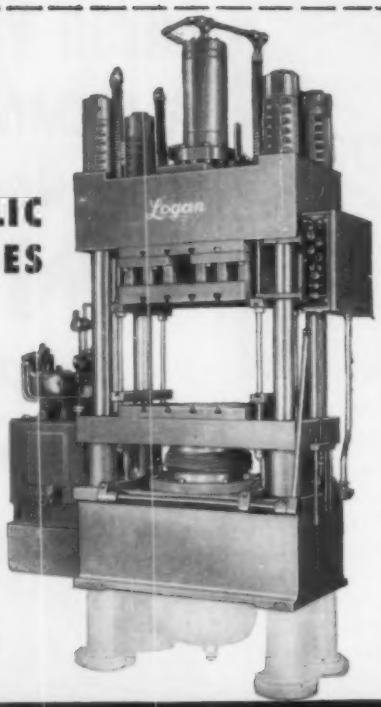

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The corrugated door panels are fabricated from polyester-glass laminate produced by Filon Plastics Corp., El Segundo, Calif. The laminate also incorporates parallel reinforcing strands of nylon.

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**(More on page 159)**

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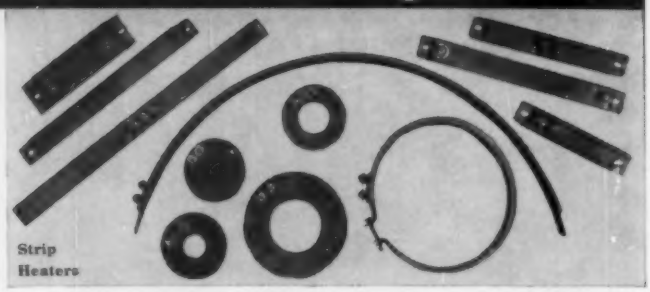


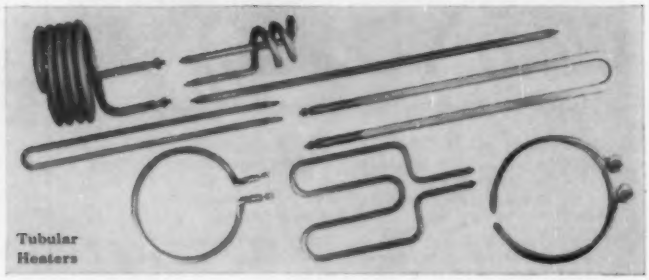


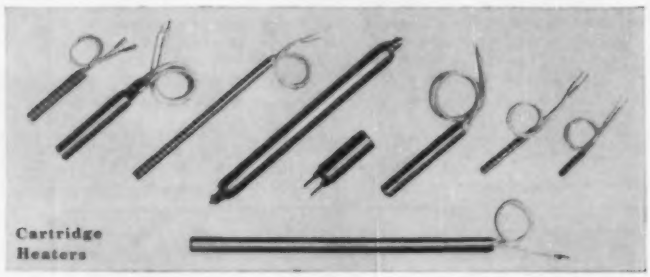


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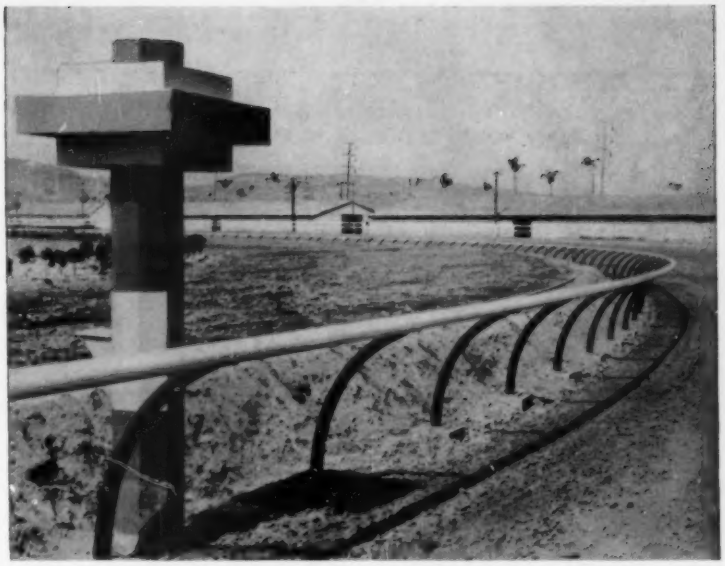


**RAILING** of reinforced plastics, installed at the Del Mar Turf Club in California. Since the tubing is considerably more elastic than steel and does not splinter, horses and men are less likely to be injured on it if an accident occurs.

## Race track railing of reinforced plastics

**A** tubular safety railing for use around the infield of horse race tracks is an unusual new application for reinforced plastics.

Made by the mandrel-wrapping process, the railing is said to be strong as steel, light as aluminum, and corrosion resistant.

A special virtue of the railing, which is produced by Amercoat Corp., South Gate, Calif., is its flexibility, which affords some protection to horses and riders in the event of an accident. To determine the elasticity of the tubing, engineers of the company, in one test, backed a large rubber tired tractor into a section of the railing. The tubing was bent about 6 in. out of line, but sprang back into its original position when the load was removed. Splintered wood railings have actually impaled horses.

The reinforced plastics railing is available in hollow circular sections 2 to 12 in. in diameter and in lengths up to 20 feet. The sections are joined together by a short length of tubing that is inserted within the abutting units. The plastic insert is not bonded to the tubes, thereby forming an expansion joint between the sections in addition to aligning them. The tubing consists of approximately 70% fibrous glass reinforcement and 30% polyester resin, and it has a tensile strength of approximately 60,000 p.s.i.

The manufacturer believes the railing has wide applications besides its initial use at a race track. It is said to be adaptable for interior use in schools, hospitals, hotels, and office buildings, and for exterior use around playgrounds, parks, factories, and similar locations.—**End**

**CLOSE-UP** of the railing section reveals a cross-grain pattern of fibrous glass under the polyester resin. The tubing is produced by the mandrel-wrap production process, and it is adaptable to other applications besides its use at race tracks.

# LITERATURE

**Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.**

**"Analytical Chemistry of Polymers Part I: Analysis of Monomers and Polymeric Materials: Plastics—Resins—Rubbers—Fibers,"** *Edited by Dr. G. M. Kline.*

Published in 1959 by Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. Volume XII in the High Polymer Series. 666 pages. Price: $16.50.

Bringing together in one volume information from many authoritative sources, this book describes the physical-chemical methods used to analyze the content and characterize most of the materials used in the plastics industry today. In addition to covering the major industrial plastics such as polyethylene and epoxies (and their raw materials), special chapters on qualitative and quantitative methods for the analysis of plasticizers, ion-exchange resins, fibers, rubbers, proteins, natural resins and drying oils are also included. Detailed descriptions of laboratory procedures and equipment are given for the newer analytical methods and modifications of existing methods. The book is clearly written, well-organized and is a valuable reference book for industrial control analysts as well as research chemists working in the polymer field. Part 2, now in preparation, will extend the current work and deal with molecular structure determination, chemical group analysis, and identification procedures for polymer.—*G.R.S.*

**"Epoxy Resins: Market Survey and Users' Reference"** *by graduate students at Harvard Graduate School of Business Administration.*

Published in 1959 by Materials Research, Box 363, Cambridge 39, Mass. 222 pages. Price: $18.50.

This excellent, comprehensive report, based on a survey of some 1000 companies manufacturing, selling, and using epoxies, contains a wealth of information on all aspects of these resins. In addition to a description of epoxy resins, hardeners, additives, etc., the various epoxy systems are discussed; and the structure of the industry, particularly the role of the formulator, is analyzed.

Perhaps the most interesting and valuable section is the detailed study of 19 industries currently using epoxy resins. Numerous applications are described and valuable cost and savings data are presented. Some examples of economic principles applied to specific uses for epoxies, and an excellent bibliography and directory of suppliers, further add to the value of this book.—*G.B.*

**"The Principles of Vacuum Forming,"** *by Alfons Thiel.*

Published in 1957 by Rudolf Zechner Verlag G.m.b.H., Speyer/Rhein, Western Germany. 122 pages. Price: DM 8.80 ($2.00). In German under the title "Grundzuege der Vakuumverformung."

This first volume in a series of handbooks on plastics is a practical guide to the techniques of vacuum forming. The text and 50 illustrations are clear and helpful to the beginner. One particularly interesting feature is a chapter on cost accounting and the bases of calculation for this specific process.

**Seamless tubing.** Mechanical and electrical properties, size range, lengths, tolerances, shapes, uses, etc., for a line of Chemtube seamless epoxy-fibrous glass tubing for use on electrical and electronic devices. MSD-54A and B. 2 pages. *Chemfab Corp., 40-30 23rd St., Long Island City 1, N. Y.*

**Encapsulation.** "Improved Casting Techniques for Void-Free Encapsulation of Electrical Components." 7 pages. Technical Bulletin 101. *Automatic Process Control, Inc., 1170 Morris Ave., Union, N. J.*

**Containers and packaging.** Bibliography of sources of information pertinent to packaging and containers for all types of materials and products as well as the various materials. Single copies free from SBA field offices, or U. S. Department of Commerce. 24 pages. *Small Business Administration, Washington 25, D. C.*

**Pulverizer.** Mill size, steam and air operation, uses, etc., for eight pulverizers, with mill diameters from 2 to 36 in., for dry pulverizing of materials to micron-size powders. 4 pages. *The Jet Pulverizer Co., Route 73, Palmyra, N. J.*

**Cellulose acetate.** Production, types, applications, chemical structure, properties, solubility, chemical resistance, plasticizer compatibility, literature references, and similar data for cellulose acetate for protective coating formulations. 36 pages. *Eastman Chemical Products, Inc., Kingsport, Tenn.*

**Mica insulation.** Properties, tolerances, composition of various grades, forms, sizes, weights, specifications, uses, etc., for a line of Micabond bonded mica insulation. Catalog M59. 16 pages. *Continental-Diamond Fibre Corp., Newark, Del.*

**Abrasives.** Specifications, prices, uses, etc., for a line of rubber bonded abrasives for polishing and finishing in the plastics and other industries. 4 pages. *The Carborundum Co., Niagara Falls, N. Y.*

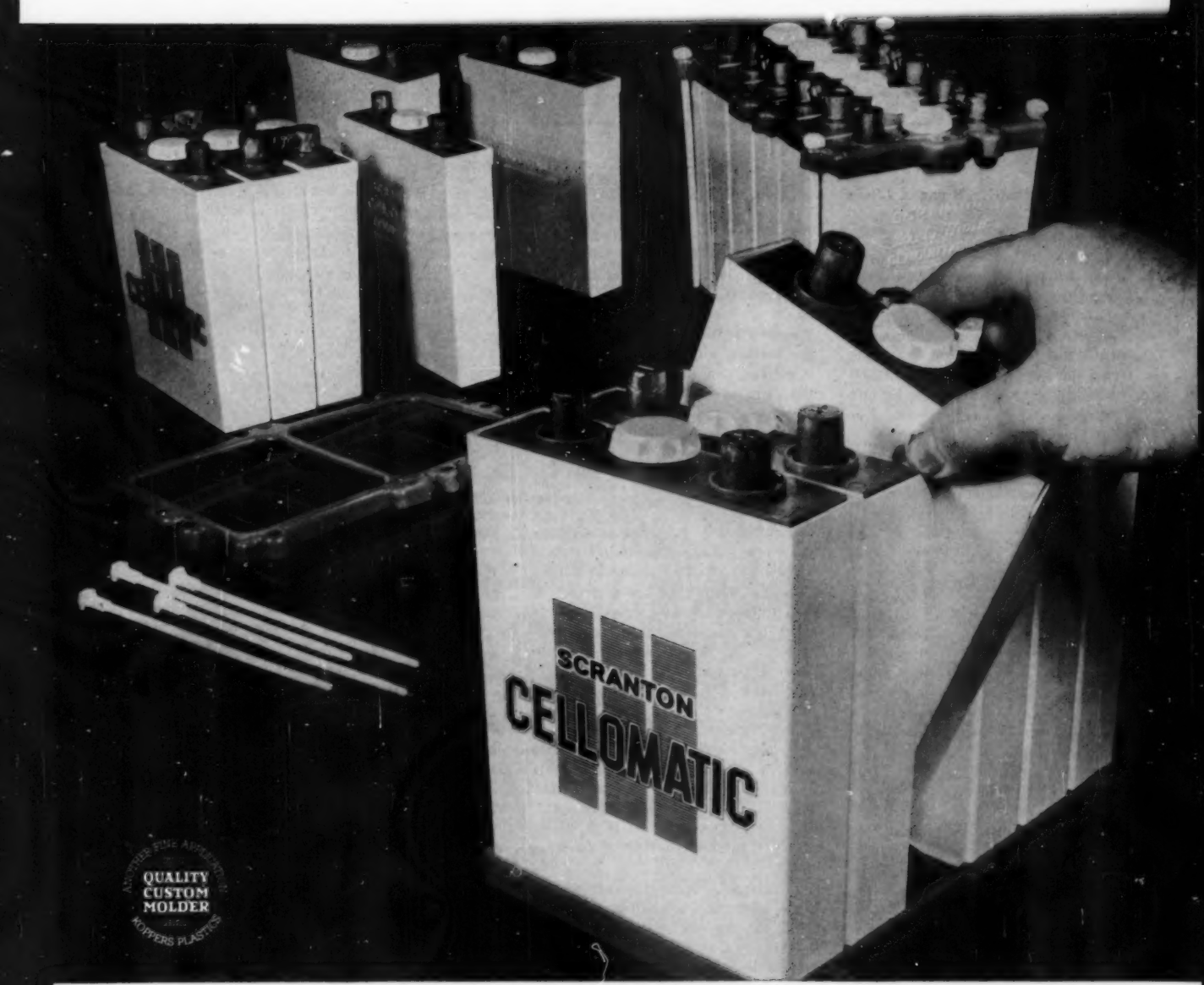
**Injection molding machines.** Specifications, outstanding features, performance data, prices, uses, etc., for a line of plastic injection molding machines from ⅓ to 1 oz. capacity. 56 pages. *Newbury Industries, Inc., Newbury, Ohio.*

**Research chemicals.** Product information digest outlines a line of production, development, and research chemicals: Diborane, methyl borate and methyl borate-methanol azeotrope, potassium borohydride, sodium borohydride, sodium hydride, sodium methyl carbonate, trimethoxyboroxine, alkyl boric acids, amine-boranes, decaborane, and others, for the plastics and other industries. Includes physical properties chart. 4 pages. *Callery Chemical Co., 9600 Perry Hwy., Pittsburgh 37, Pa.*

**Glass-to-metal bonding.** "Modified Epoxy Resin Adhesives for Glass-to-Metal Bonding" gives two adhesive formulations that were found to possess the desired flexibility, bond strength, and aging stability, plus other technical data. 12 pages. *Thiokol Chemical Corp., 780 N. Clinton Ave., Trenton 7, N. J.*

**Filters.** Specifications, sizes, uses, etc., for a line of filters resistant to high temperatures. Includes data on how to plan the proper filtration system. 48 pages. *Flanders Filters, Inc., Riverhead, N. Y.*

**Molecular Sieves.** Case history, uses, etc., for Linde molecular sieves, which are synthetic metal-alumino silicates for plastics **(To page 162)**




Manufacturer: Scranton Cellomatic Corporation, Archbald, Pa. Molder: Peerless Plastics, Culver City, California.

# New-type auto battery uses replaceable cells of light, strong DYLENE® plastic

If one cell dies in this newly designed battery, it isn't necessary to replace the whole battery unit—just the dead cell! What keeps this compact money-saver from being oversized and impractical? DYLENE polystyrene—a tough, heat-resistant and acid-resistant plastic.

DYLENE's superior strength allows the cell walls to be designed so that the multi-celled unit is far lighter in overall weight, and no larger than the old-type automobile battery. DYLENE is dimensionally stable. It molds in varying shapes and sizes; each molded part is identical to the last, and regardless of size or shape, DYLENE retains its basic quality.

The di-electric properties of DYLENE was another reason for its choice. It resists arcing, bridging and seepage of current. Moreover, these cells will last longer, because DYLENE has great resistance to shock, impact and heat. These cells are held firmly in place by frames made of SUPER DYLAN® high-density polyethylene—another fine Koppers plastic.

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*DYLITE® expandable polystyrene, SUPER DYLAN® polyethylene and DYLAN® polyethylene are other fine plastics produced by Koppers Company, Inc.*

KOPPERS

# LITERATURE

*(From page 160)*

and other industries. 8 pages. *Linde Co., Div. of Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y.*

**Epoxy laminating resin.** Description, mixing procedure, pot life and curing schedules, properties, etc., for Epocast 28, an epoxy laminating resin which is used for glass cloth, structural laminations, and electrical insulating purposes. 3 pages. *Furane Plastics, Inc., 4516 Brazil St., Los Angeles 39, Calif.*

**Blister attachment.** Data sheet on the Pak-O-Vac automatic blister attachment—available in two sizes—which handles most thermoplastic films. 1 page. *Product Packaging Engineering, 5713 Joanne Pl., Culver City, Calif.*

**Fluorescent pigments.** Physical and chemical characteristics, colors available, applications, formulations, etc., for a line of fluorescent pigments for plastics, plastisols, organosols, etc. 4 pages. *Lawter Chemicals, Inc., 3550 Touhy Ave., Chicago 45, Ill.*

**Motion picture.** "New Dimensions in Comfort" is a 13½-min. sound and color film depicting the advantages of flexible urethane foam as a furniture cushion material. On loan from *Public Relations Dept., National Aniline Div., Allied Chemical Corp., 40 Rector St., New York 6, N. Y.*

**Infra-red spectrophotometer.** Specifications, uses, accessories, performance data, etc., for an automatic recording infra-red spectrophotometer for use in industrial laboratories. Bulletin 724. 20 pages. *Beckman/Scientific and Process Instruments Div., 2500 Fullerton Rd., Fullerton, Calif.*

**Recorders; recording controllers.** Specifications, dimensions, applications, typical control system schematics, etc., for a line of continuous self-standardizing strip-chart recorders and recording controllers for measurement of electrical and process variables. Bulletin GEA-6887. (Supersedes GEA-6792). 12 pages. *General Electric Co., Schenectady 5, N. Y.*

**Thermoforming of plastic sheet.** Manual describes materials, storage, cutting and layout, heating, molds or formers, forming methods, machining and trimming, assembly, cleaning and polishing, decorating, design, cross sectional control, case histories, etc., on the low pressure forming of thermoplastic sheet. 48 pages. *The General Tire & Rubber Co., Bolta Products Div., 70 Garden St., Lawrence, Mass.*

**Polyethylene.** Report on present uses for Marlex polyethylene, future applications, technical assistance from the firm, and the latest technical information, including physical and chemical properties, processing and applications, special characteristics, etc. 48 pages. *Phillips Chemical Co., Bartlesville, Okla.*

**Mixing head.** Specifications, construction and operational data, prices, etc., for a mixing head for valving, mixing, and dispensing of polyurethane foams; rigid, semi-rigid, and flexible polyesters; polyethers; etc. 6 pages. *The Martin Sweets Co., Inc., 114 S. First St., Louisville 2, Ky.*

**Alkylolamides.** "Metholene Esters for Alkylolamides" gives the procedure for using methyl esters of fatty acids as intermediates. Includes specifications for methyl esters. Bulletin 415. 8 pages. *Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio.*

**Vulcanized fibre.** Description, weight table, general and engineering data, uses, etc., for six standard and five special grades of vulcanized fibre, a regenerated cotton cellulose. Data Sheet 2-0. 4 pages. *Taylor Fibre Co., Norristown, Pa.*

**Heat sealable valley inks.** Properties, uses, colors, prices, etc., for a line of fire resistant solvent inks for vinyl valley printing. Technical Bulletin 335. 2 pages. *Claremont Pigment Dispersion Corp., 39 Powerhouse Rd., Roslyn Heights, N. Y.*

**Production facilities.** History of the firm, production facilities, and description of new headquarters buildings recently erected. 16 pages. *Ciba Co., Inc., Fair Lawn, N. J.*

**Blow molding equipment.** Production capacity, bottle sizes, advantages, and similar data for the "Auto-Blow" blow molding system. 2 pages. *The Granbull Tool Co., Ltd., 39 High St., Kingston-on-Thames, Surrey, England.*

**Production facilities.** Laboratory, engineering, and quality control facilities, partial list of products produced, etc. 4 pages. *Lunn Laminates, Inc., Huntington Station, L. I., N. Y.*

**PE film standards.** "Which Polyethylene Film Should I Use?" gives the commercial PE film standards currently being circulated for approval by the U. S. Department of Commerce; includes a sample listing of packaging uses for PE film, along with the desirable property requirements for each application. 4 pages. *U. S. Industrial Chemicals Co., 99 Park Ave., New York 16, N. Y.*

**Acrolein.** Physical and chemical properties, uses, recommendations for safe handling, etc., for acrolein, a highly reactive chemical for the plastics and other industries. 24 pages. *Shell Chemical Corp., 50 W. 50th St., New York 20, N. Y.*

**Polymer product directory.** Lists complete line of polyvinyl acetate emulsions and solutions, polystyrene emulsions, styrene-butadiene emulsions, acrylic emulsions and solutions, sodium polyacrylate thickeners, polyvinyl alcohols, and polyvinyl acetate bead resins. 8 pages. *Borden Chemical Co., Polyco-Monomer Department, 350 Madison Ave., New York 17, N. Y.*

**Thermoforming machines.** Specifications, sizes, uses, etc., for a line of thermoforming machines which will handle up to 48- by 72-in. sheets. 3 pages. *Air-O-Flow Industries, Inc., 329 Canal St., New York 13, N. Y.*

**Temperature control.** Specifications, uses, available temperature sensing probes, etc., for Thermistor temperature controls, which are used in controlling temperatures on plastic bag sealers, etc. Bulletin MC-179. 2 pages. *Fenwal, Inc., Ashland, Mass.*

**Saw blades.** Specifications, uses, etc., for a line of carbide tipped saw blades for the plastics and other industries. Catalog G-159. 6 pages. *Deluxe Service Tool Corp., 1108 Grand Ave., North Bergen, N. J.*

**Shipping containers.** Versatility, uses, sizes and shapes, etc., for a line of shipping and storage trays, boxes, reusable shipping containers, barrels, etc. Brochure includes six case histories. 6 pages. *National Vulcanized Fibre Co., 1059 Beech St., Wilmington 99, Del.*

**Process instrumentation.** Features, specifications, capacities, uses, etc., for a line of meters, instrumentation, feeders, control systems, and process equipment. **(To page 164)**

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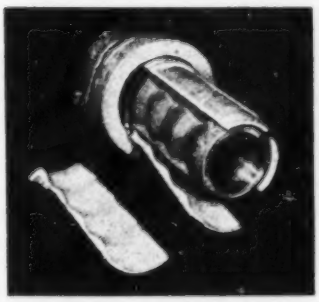

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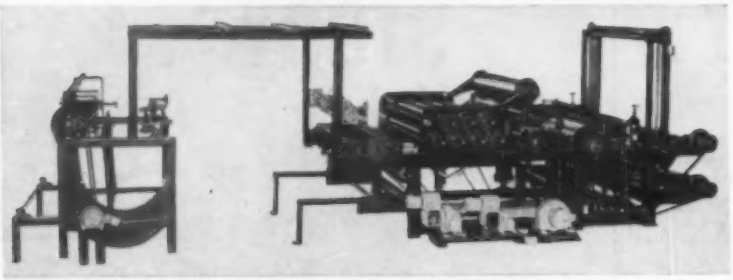

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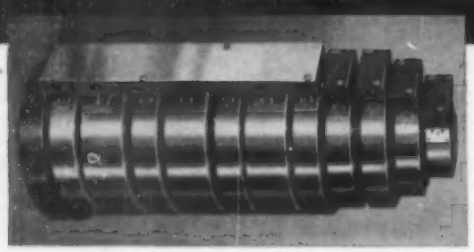

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**Bulletin BIF 5-1.** 4 pages. *B-I-F Industries, Inc., 345 Harris Ave., Providence 1, R. I.*

**Plastic fluors.** Size ranges, scintillation characteristics, applications, conversion of radiations, etc., for solid solution plastic fluors in sizes up to 5000 cu. inches. Bulletin FL-201. 4 pages. *Cadillac Plastic & Chemical Co., 15111 Second Ave., Detroit 3, Mich.*

**Air motors.** Sizes, specifications, uses, etc., for a line of air motors, compressors, and vacuum pumps for the plastics and other industries. Booklet APP-459. 12 pages. *Gast Mfg. Corp., Benton Harbor, Mich.*

**Molds.** "Molds for the Plastic and Die Casting Industry" describes the facilities and services offered for making injection, compression, and transfer molds. 4 pages. *Liberty Tool & Machine Co., 18 S. 20th St., Irvington 11, N. J.*

**Isobutyl alcohol.** Specifications, properties, effect on evaporation rate, applications, etc., for isobutyl alcohol, which is used as a solvent and chemical intermediate in the plastics and other industries. Bulletin B-104. 8 pages. *Eastman Chemical Products, Inc., Kingsport, Tenn.*

**Custom molding.** Describes equipment and facilities for injection molding small plastics parts—up to 6 ounces. Bulletin 5904. 4 pages. *Wilcox Products Co., 3455 Dakota Ave., Minneapolis 16, Minn.*

**Urethane wheels.** "Disowheel . . . Strong as Steel—Resilient as Rubber" gives case histories and uses for a line of polyurethane elastomer wheels. 4 pages. *Disogrin Industries, Inc., 510 S. Fulton Ave., Mount Vernon, N. Y.*

**RP laminates.** "Catalog of Technical Reports" is a bibliography of reports in this field, conducted by the Armed Forces and other government agencies as well as by the Germans during World War II. Catalog CTR-292. Price: 10 cents. *U. S. Dept. of Commerce, Washington 25, D. C.*

**Production facilities.** "Danco Today!" describes the facilities and products of the firm. 2 pages. *The Danielson Mfg. Co., Danielson, Conn.*

**Calendering.** "Adjustable-Speed Drive Equipment for Calenders" describes a planned program of drive modernization, and gives ideas on how to determine the drive that best suits the reader's requirements. 8

pages. *Direct Current Motor & Generator Dept., General Electric Co., Erie, Pa.*

**Corrosion-resistant reinforced plastics.** Physical properties, chemical resistance, typical equipment applications, etc., for a line of polyesterglass industrial corrosion-resistant equipment. Catalog P-11. 28 pages. *Haveg Industries, Inc., 900 Greenbank Rd., Wilmington 8, Del.*

**Amines.** Physical properties, end-use possibilities, specifications, test methods, physiological properties, storage and handling, etc., for 19 alkyl and alkylene amines. 32-item bibliography. 52 pages. *Union Carbide Chemicals Co., 30 E. 42nd St., New York 17, N. Y.*

**Flow tubes.** Dimensions, recovery characteristics of differential producers, construction combinations, comparison of vault sizes and pumping costs, and other data on a line of insert-type plastic dall flow tubes. 4 pages. *Builders-Providence, Inc., Providence 1, R. I.*

**Polyethylene.** Basic resin characteristics, density, melt index, molecular homogeneity, environmental effects, environmental stress-cracking; weathering, temperature, applications, markets, etc. for a line of low- and medium-density polyethylene. 32 pages. *Spencer Chemical Co., Dwight Bldg., Kansas City 5, Mo.*

**Resins.** "Our Greatest Business Asset" describes the trademarks of the firm—Formvar (polyvinyl formal); Butvar (polyvinyl butyral); Gelva (polyvinyl acetate resins, emulsions, solutions, and copolymers); and Gelvatol (polyvinyl alcohol)—and how to use these names properly. 4 pages. *Shawinigan Resins Corp., Springfield 1, Mass.*

**Resilient polyester, styrene type.** Viscosity, specific gravity, weight per gallon, color, Barcol hardness, uses, etc., for IC-1390 styrene type resilient polyester. 2 pages. *Interchemical Corp., Finishes Div., 1754 Dana Ave., Cincinnati 7, Ohio.*

**Liquid polyvinyl.** Physical properties, methods of applying, technical information, etc., for Logosol liquid polyvinyls for industry. 16 pages. *Bee Chemical Co., Logo Div., 12933 S. Stony Island Ave., Chicago 33, Ill.*

**Gaskets.** Sizes, uses, etc., for a line of plastics, synthetic, natural rubber, and polymer gaskets. 4 pages. *Hecht Rubber Co., Inc., 482 Riverside Ave., Jacksonville, Fla.*

**Teflon coated glass yarns.** Properties, applications, sizes, and similar data for Chemo Teflon coated glass yarns. Product Data Sheet 2. *Chemo Products, Inc., P. O. Box 169, W. Warwick, R. I.*

**Recording tape.** "How Magnetic Instrumentation Tapes of Mylar Provide Maximum Reliability" relates detailed analysis of film properties to tape performance characteristics. Includes properties chart and sample of 1.5-mil cellulose acetate film and 1-mil Mylar polyester film for comparison. 12 pages. *Film Dept., E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del.*

**Vinyl-metal laminates.** Range of metals and finishes, design advantages, product applications, technical data, and recent developments concerning Arvinyl vinyl-metal laminates. 8 pages. *Arvin Industries, Inc., Columbus, Ind.*

**Octylene oxide.** "Octylene Oxide as a Reactive Diluent for Epoxy Resins" gives viscosity, formulations, properties of the resin system, and other technical data. **(To page 166)**


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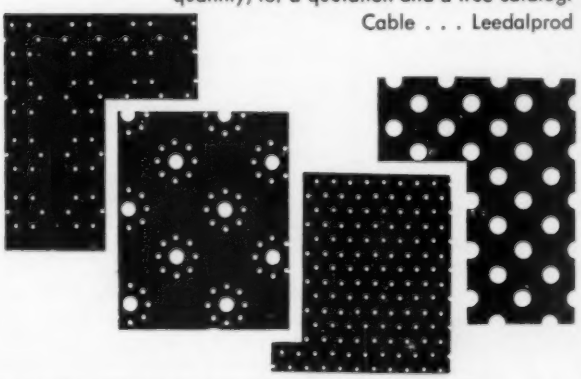

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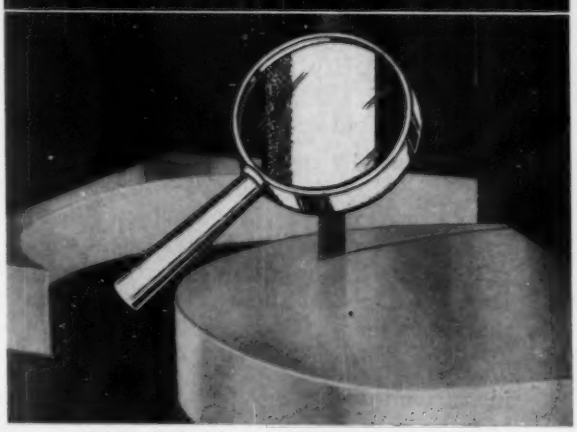

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T.I. Sheet 71. 6 pages *Chemicals & Plastics Div., Food Machinery & Chemical Corp., 161 E. 42nd St., New York 17, N. Y.*

**Fibrous glass panels.** "Important Facts About Fiberglass Panels" tells its story with cartoon-type format. 1 page. *Barclite Corp. of America, 385 Gerard Ave., New York, N. Y.*

**Facts About Plastics.** Pocket-sized booklet compares outstanding properties and typical industrial applications of 13 plastic families. Five major misconceptions about plastics are corrected. 4 pages. *Cadillac Plastic & Chemical Co., 15111 Second Ave., Detroit 3, Mich.*

**Polyvinyl chloride.** "The Geon Story" discusses Geon PVC—its nature, forms, and uses; how it is processed; product applications; consumer advisory service; etc. 46 pages. *British Geon Ltd., Devonshire House, Piccadilly, London W1, England.*

**Urethane prepolymers.** Three technical bulletins discuss Thiokol's urethane prepolymers designed for use in the production of rigid foams. "Thiokol's Rigithane 334 Foaming Resin for Use in Preparing Rigid Foams with Structural Strength and Low Thermal Conductivity." Bulletin R-334-1. "Catalyst Systems C334-R2SE and C334-R2 for Two-Pound Density Rigithane 334 Foam Formulations." Bulletin R-334-2. 4 pages. "Rigithane 334-2HH Foaming Resin." Bulletin R-334-3. 4 pages. *Thiokol Chemical Corp., 780 N. Clinton Ave., Trenton 7, N. J.*

**Styrene copolymer resin.** Physical properties, viscosity, uses, etc., for three grades of Piccoflex styrene copolymer resin. Bulletin P-12-91-1-5-59. 1 page. *Harwick Standard Chemical Co., 60 S. Seiberling St., Akron 5, Ohio.*

**Dry processing equipment.** Specifications, sizes and fluid energy requirements, uses, etc., for a line of crushers, grinders, pulverizers, micron-grinders, separators, granulators, blenders, mixers, feeders, screens, elevators, conveyors, mechanical dens and excavators, etc., for the plastics and other industries. 8 pages. *Sturtevant Mill Co., Park and Clayton Sts., Boston 22, Mass.*

**Plastisol.** Four examples of the use of polyvinyl plastisols for production economies and ease of fabrication. Includes handling characteristics, applications, etc. 4 pages. *Chemical Products Corp., King Philip Rd., East Providence, R. I.*—**End**

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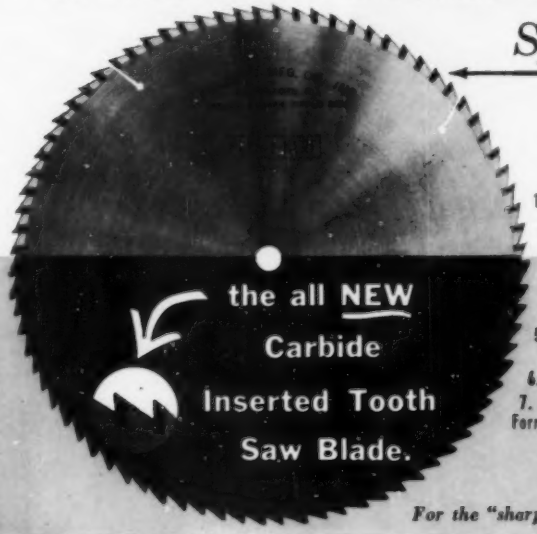


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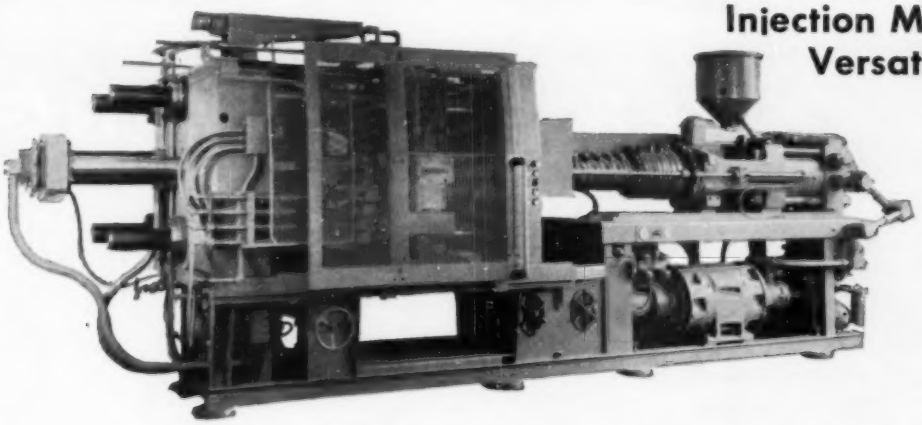

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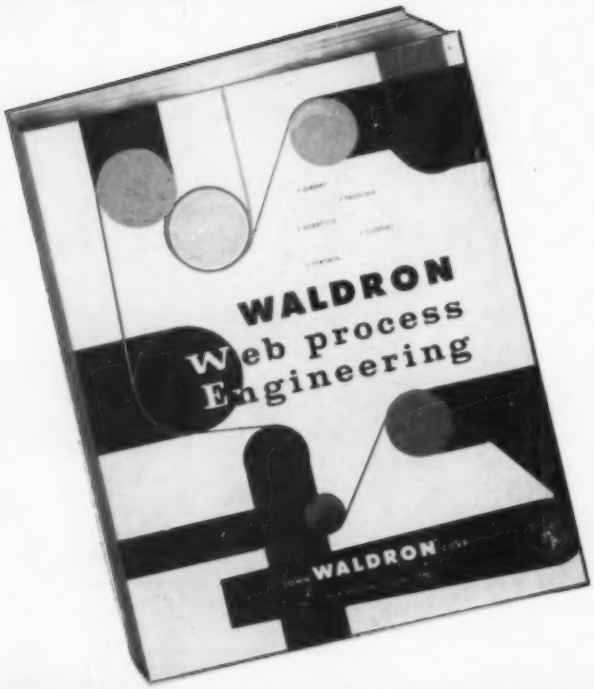


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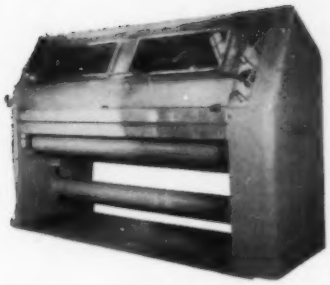
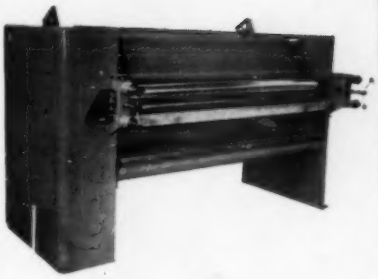
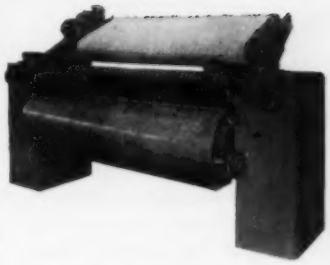
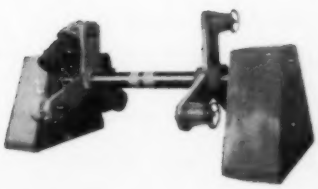

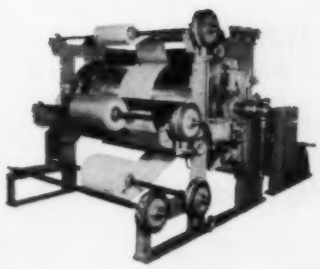

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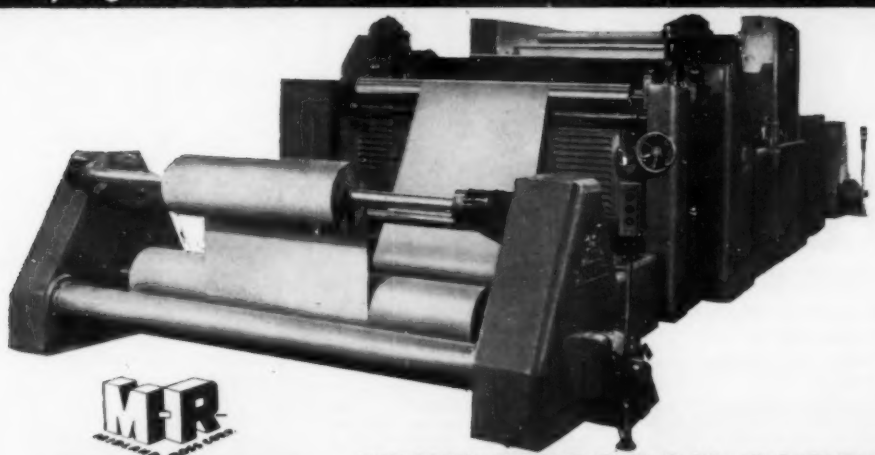

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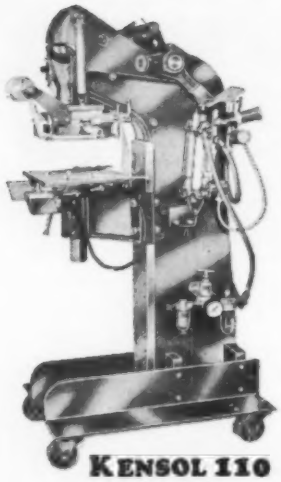

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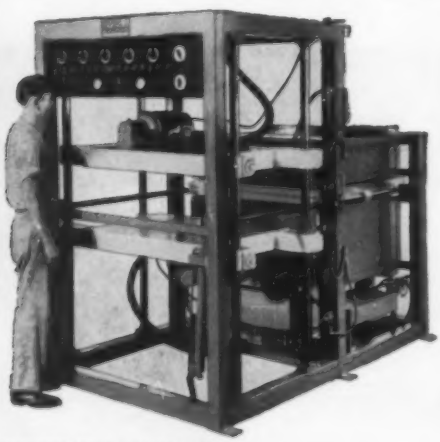

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Progress in Plastics


## Plastics Patents

(*From page 52*)

*Polyepoxides.* M. DeGroote, K. Shen, and J. Cheng (to Petrolite). 2,888,-425-31.

*Curing polyurethanes.* E. E. Fauser (to Goodyear). 2,888,432.

*Diisocyanate-modified polyester.* J. A. Parker (to Armstrong Cork). 2,888,-433.

*Polyacrylonitrile composition.* V. E. Shashoua (to Du Pont). 2,888,434.

*Polyfunctional polymers.* J. E. Pritchard (to Phillips). 2,888,435.

*Catalyst for polyurethanes.* A. F. Finelli and N. V. Seeger (to Goodyear). 2,888,437.

*Polyureas of aromatic diamines.* M. Katz (to Du Pont). 2,888,438.

*Polyurethane diamines.* D. M. Simons, A. H. Frazer, and E. J. Goldberg (to Du Pont). 2,888,439-40.

*Chelating resins.* L. R. Morris (to Dow). 2,888,441.

*Conjugated diene-mercaptan polymers.* C. A. Uranek and W. M. St. John (to Phillips). 2,888,442.

*Ethylenic-fluorinated polymers.* R. L. Herbst, Jr. and B. F. Landrum (to Minnesota Mining). 2,888,446.

*Polymers of 1,1,4,4-tetrafluorobutatriene.* E. L. Martin and R. E. Putnam. (to Du Pont). 2,888,447.

### U. S. Pats., June 2, 1959

*Continuous polymerization.* W. Rodenacker, E. Istel, and R. Schnegg (to Bayer). 2,889,211.

*Phenolic resin composition.* T. A. Gregory and E. J. Shelton (to Reichhold). 2,889,241.

*Chlorosulfonation of polyethylene.* H. Noeske and O. Roelen (to Ruhr Chemie). 2,889,259.

*Phosphorus-containing aziridinylamine polymers.* W. A. Reeves, L. H. Chance, and G. L. Drake, Jr. (to U. S.) 2,889,289.

*Linear polycyclospiroacetals.* D. B. Capps (to Chemstrand). 2,889,290.

*Cellular polyurethanes.* H. R. Moore. 2,889,291.

*Alkyd-polyamide composition.* D. E. Peerman (to General Mills). 2,889,292.

*Oil-modified alkyd resins.* W. L. Hensley, A. J. Kirsch, and R. E. Layman, Jr. (to American Cyanamid). 2,889,293-4.

*Vinyl halide polymers.* J. R. Darby and P. R. Graham (to Monsanto). 2,889,295.—**End**

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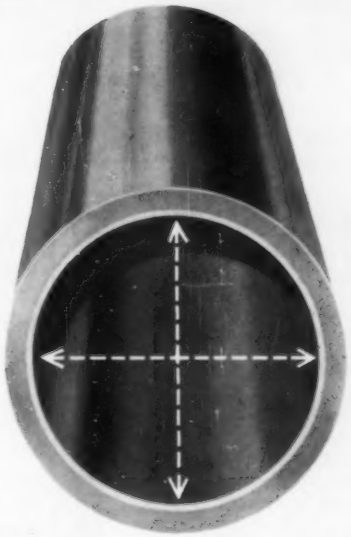

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## Lint filters

*(From pp. 85-87)*

of Celanese Fortiflex "A", which is a linear polyethylene.

Produced at a cost estimated at approximately 75% less than that of a comparable metal part, the Maytag lint screen retainer is made by The General Industries Co., Elyria, Ohio. Run as a two-cavity job, the component is molded on a 25-oz. Watson-Stillman injection machine. Measuring approximately 9½ in. in diameter, the part is center gated on the front surface and contains 288 openings, in addition to the finger grips in the center.

The retainer is used in conjunction with a fine-mesh metal screen which mounts in position on the back of the part and is easily removable for cleaning. To permit the retainer to be snapped on and off the mounting shaft at the back of the dryer, the retainer is molded with eight flexible "petals" on the back surface—a design feature which would have been very difficult to achieve with a rigid metal part. The resiliency of the linear PE material permits the retainer to be removed and replaced hundreds of times without affecting the snug fit required.

When the homemaker wishes to fit the dryer for dampening clothes prior to ironing, she can replace the filter unit with Maytag's new Automatic Clothes Sprinkler. This is a hollow, disk-like component made by cementing two injection molded halves together. In use, the sprinkler is filled through the center opening and the rubber stopper is closed, after which it is placed in position on the fan shaft. As the fan rotates, water in the disk is metered via an internal aluminum tube out through two small openings near edge of the sprinkler.

Using Dow Styron 440 high heat, high-impact styrene material, Artag Plastics Corp., Chicago, Ill., molds and assembles the Maytag sprinkler unit. Maytag design engineers selected this material because it was easier and less costly to fabricate than metal, heat and corrosion resistant, and made an attractive white component with integral color.—**End**

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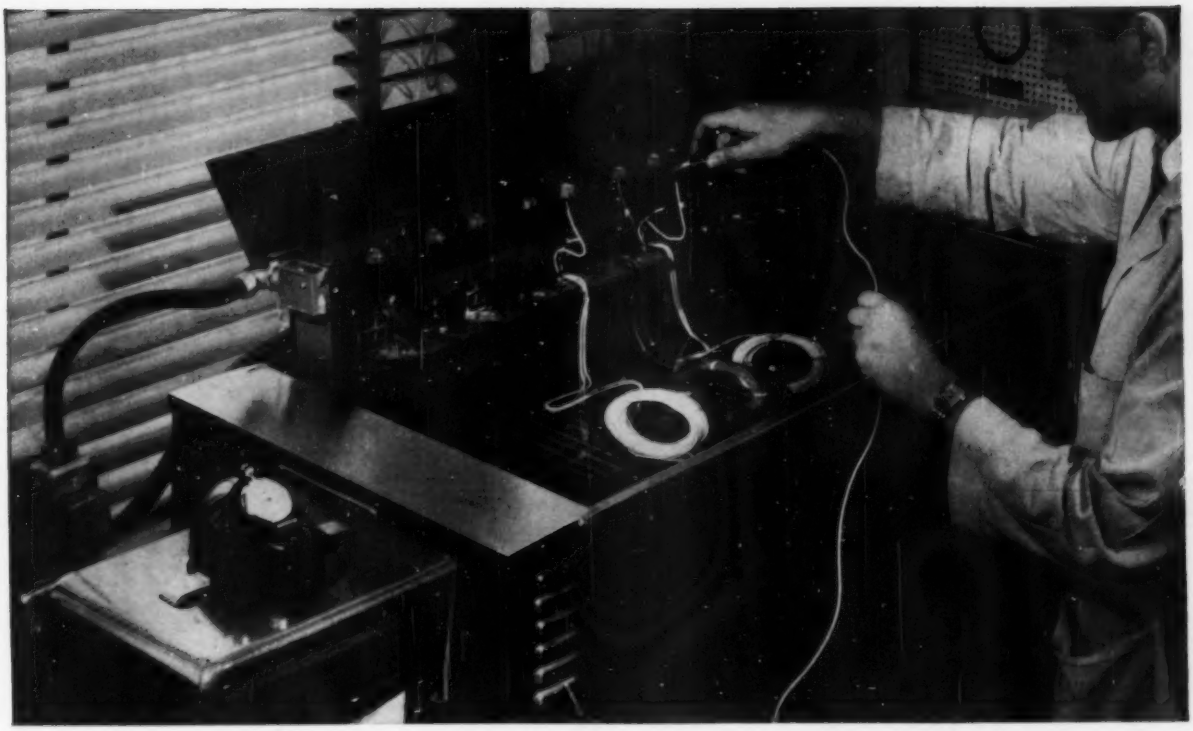

Immersion test proves DYTHAL stabilizer gives top performance to 75°C THW vinyls.

# How DYTHAL® stabilizer is helping the electrical industry develop a new insulation, 75°C THW

## *. . . improved vinyl stocks will lift rating of building wire by 15°C*

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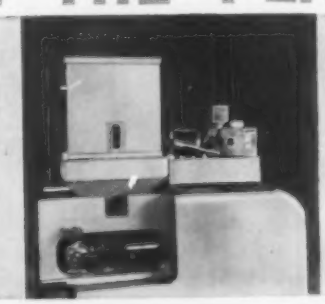

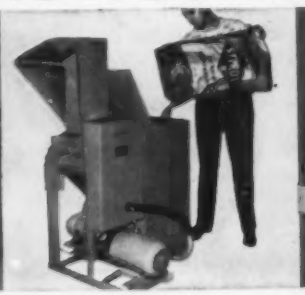

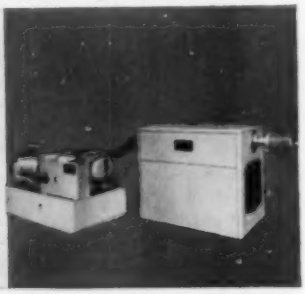

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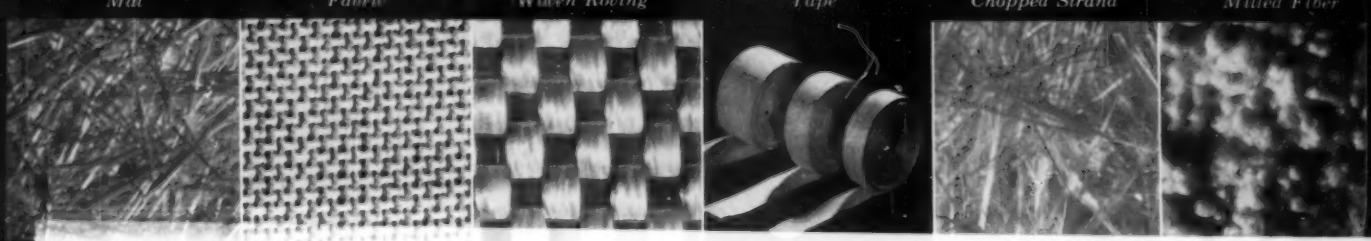

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## Flame resistance

*(From pp. 81-84)*

might be a problem. Again, corrosion of molds or dies or machines can be severe when salt-type halogens are used in big quantities because the halogen must be released in order to snuff out the flame and, if it is released in the presence of moisture, corrosive acids are formed. Add corrosion inhibitors and you inhibit the halogens' self-extinguishing value. Furthermore, light stability of polystyrene compounds to which have been added halogen salts is not very satisfactory.

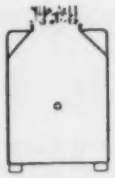
Chlorinated waxes have been used with styrene materials but large amounts of chlorinated waxes and stabilizers tend to give the plastic opacity and make it difficult to color with brilliant tones. Furthermore, heat distortion point may be reduced as much as 25° F. Chlorinated rubbers have been used as additives for high-impact polystyrene and ABS types. But they are not inherently as heat stable as the base plastic or the other alloying rubbers, and sometimes cannot withstand high enough processing temperatures.

With all additives to polystyrene and other styrene materials, it is essential that the material be kept dry to prevent corrosion and that processing conditions be carefully controlled to prevent decomposition. All of the self-extinguishing polystyrene formulations which have been offered to date necessitate a price increase ranging from 15¢ to 40¢ a pound over standard material.

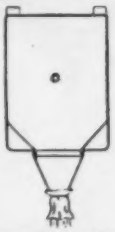
### Fire resistance of thermosets

In the thermoset area the phenolics are inherently self-extinguishing in accordance with ASTM D 635. Some specialty phenolics have been recently announced which have increased flame resistance, particularly with fire-resistant reinforcements and fillers. The use of additives in phenolics is reported sometimes to have an adverse effect on their electrical properties and they also present troublesome handling and processing problems.

The story on the flame-resistant polyesters is well known. Some are made by chlorinating the resin

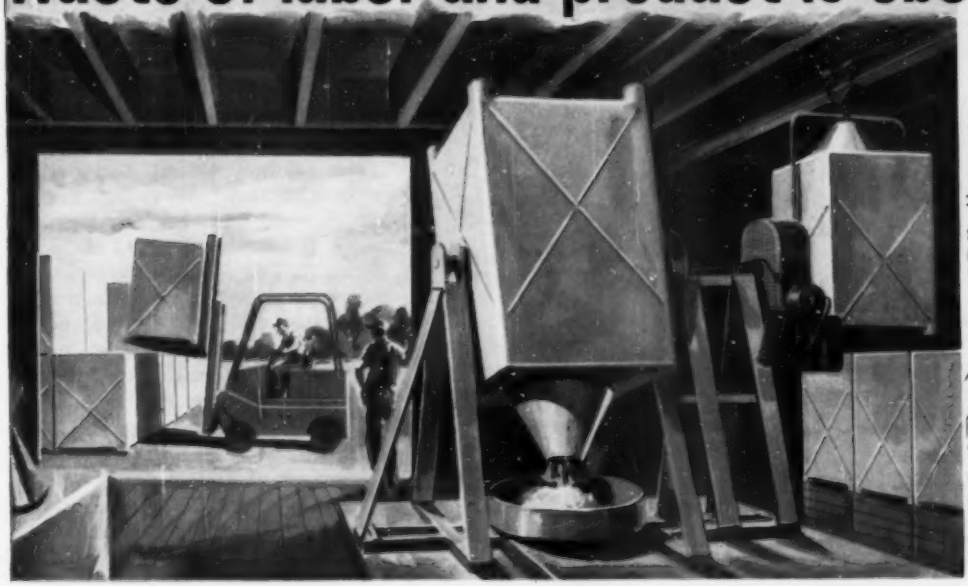


**Fills Fast**—22" opening permits fast filling of powdered materials. Internal cone conforms to angle of repose of product.



**Empties Clean**—Internal cone funnels all materials out of bin. No residue remaining.

# Waste of labor and product is obsolete...



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by reaction and not just as a free additive. In some cases antimony trioxide is added by the user and in other cases a chlorinated wax is added to standard resins. Care must be taken to balance ingredients in such alloys so that molding and weathering properties, and shrink, as well as aging may not be affected seriously.

As can be seen from the above, we're a long way from "transparent stainless steel." Readers will remember, parenthetically, that steel girders and skyscrapers have to be encased in fireproof materials because of steel's low heat distortion point when it is carrying a structural load.

Progress is being made on all fronts and in connection with all materials, but we still come back to a) design and engineering; b) test procedures relating to definition and to purpose; and c) recognition of the relationship between function and hazard. The fire hazard of a plastic material is a function of *all* of its relevant properties in relation to the expected conditions of its use.

No mention of any material makers or their self-extinguishing plastics materials has been made in this article. And these specialty materials are not covered in their general plastics properties charts. Therefore, in our October issue we plan to carry a special chart featuring these particular resins, together with their properties.

Design and engineering, of course, can do a great deal to increase the effectiveness in reducing or avoiding fire hazards. Definitions and tests which describe the ignition risk more completely, go along to help designers approach their work with a better understanding of how they can achieve satisfactory function and appearance, while time providing appropriate safety conditions.

Cooperative work between fabricators, end users, material suppliers, and regulatory agencies is going on extensively, and is growing rapidly. The plastics industry is looking carefully at its materials and their engineering and esthetic advantages and is working in many fields to assure safe use in keeping with practical, economic, and human considerations.—**End**

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—glossy finish and even color; faster molding operations.

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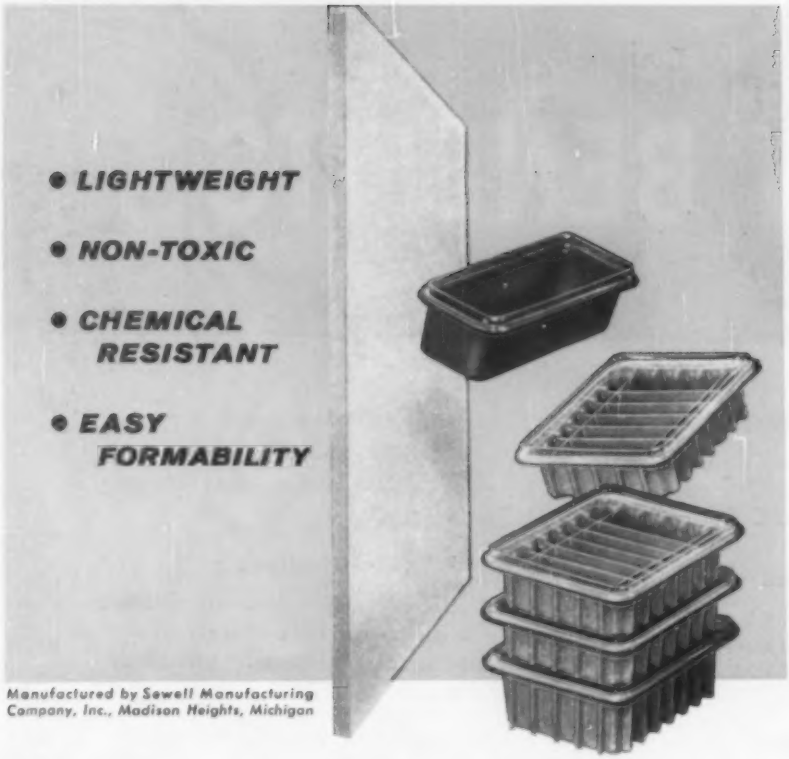


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## Jets

*(From pp. 102-103)*

molded of Shell 828 epoxy resin and 181 glass cloth in a complex series of fabrication steps (see below), the hat sections arrive at the Douglas facilities in 10-ft. length, ready for cutting to size and bonding. The individual aluminum floor panels are of varying size, generally a foot in width and contoured to the outlines of the plane. The hat sections are attached in parallel strips, 5 in. apart, running lengthwise with the plane. Minnesota Mining & Mfg.'s AF-32 epoxy impregnated glass tape is used as bonding agent. Vacuum provides pressure during heat cure.

The removable floor panels carrying the hat section form the upper portion of the double-layer floor. They are bolted in place with the plastic spacers in a downward, upside-down position, with tops of the hat sections resting on aluminum subfloor.

Permanently riveted to the aluminum subflooring are additional RP sections—Z-type for the ends of each panel and a broad hat shape at the panel mating lines. The aluminum panels are held in place by screws or rivets that protrude down through these edge spacers and into the subflooring. The only other metal-to-metal contact between cabin interior and the floor structure is a series of parallel aluminum rails on which the seats rest.

Douglas has subjected the floor panels to grueling tests to prove their ability to stand up to foot traffic. No failure could be detected in the bond between the hat sections and the aluminum, or in the hat sections' laminations.

### How they are made

The original hat sections were of uniform thickness throughout the cross-section. But almost a mile of the strips are required for a single DC-8, and this led to a search for a design that would provide the necessary strength but at a reduced weight. The final configuration features a sharp taper in the flanges and a lightening in the vertical walls of the hat section (see diagram on p. 103). While this saved **(To page 186)**

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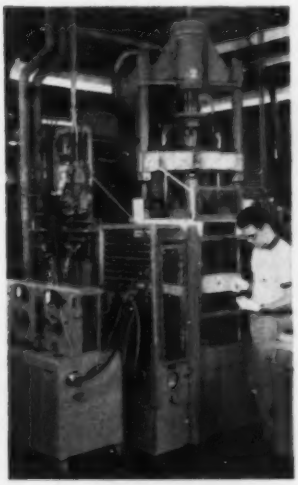

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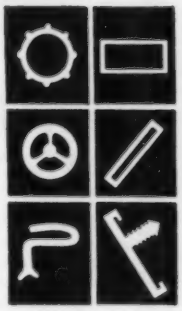

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**EXTRUDERS.** 12-page catalog gives specifications for a line of extruders in sizes of 1½, 2, 2½, 3½, 4½ and 6 inches, with L/D ratios of 15:1, 21:1, 24:1 and 30:1. Sterling Extruder Corp. **(I-901)**

**CADMIUM LITHOPONE PIGMENTS.** Color chart shows pigments in 11 colors, at full strength, 50% color and 20% color. Table of properties tells specific gravity, weight per solid gallon, one-pound bulks, oil absorption and hiding power. Harshaw Chemical Co. **(I-902)**

**WEIGH FEEDER FOR INJECTION MOLDING.** Illustrated 4-page brochure describes a weigh feeder of 100 lb. capacity. Mechanical drawings, specifications. Insert describes the automatic plunger position control which is standard equipment. Exact Weight Scale Co. **(I-903)**

**PLASTICS FOR SPRAY-COATING.** Three booklets, each describing a variety of tough plastic finish which can be sprayed on metal, wood, etc. in several textures, including leather. Physical and chemical properties and details of application are given. John L. Armitage & Co. **(I-904)**

**TECHNICAL DISCUSSIONS OF POLYETHYLENE.** 12-page periodical. Current issue carries articles titled: New Fields for Polyethylene; The Chemistry of Crosslinked Polyethylene; Crosslinked Polyethylene Compounding, Processing, Testing. Also 4 laboratory compounding studies. R. T. Vanderbilt Co., Inc. **(I-905)**

**SLAT EXPANDER.** Bulletin sheet describes a slat expander for plastic-film processing lines, available in wood for normal temperatures and aluminum for ovens temperatures up to 550°. 5" diameter. Kay Machine Co., Inc. **(I-906)**

**HOT-STAMPING TAPE.** Folder and accompanying samples provide data on a line of specialized roll leaf for use in hot-stamping plastic surfaces. Included are high-gloss and flat types, in colors and metallics. Admiral Coated Products, Inc. **(I-907)**

**CONSULTING CHEMISTS.** Folder describes an organization which offers consultant service to manufacturers in plastics and rubber. Aspects discussed are product development, trouble shooting, product evaluation, analysis, evaluation of new materials. Foster D. Snell, Inc. **(I-908)**

**EXTRUDING EQUIPMENT.** Illustrated 4-page brochure describes an extruder in models offering up to 75 lbs. per hour capacity in sizes of 1 to 6 inches, and lists manufacturing facilities for design, redesign, replacement, development, etc. Killion Tool & Mfg. Co. **(I-909)**

**FINANCING FOR INCOME PRODUCING EQUIPMENT.** 16-page booklet describes an organization of factors who offer the plastics manufacturing field financing for the acquisition of production equipment. Data sheet gives details of typical and special transactions. Standard Financial Corp. **(I-910)**

**EQUIPMENT CATALOG.** Illustrated 16-page catalog describes 73 pieces of research, control and production equipment under these headings: abrasion testers, biological and scientific equipment, flammability—ignition testers, thermal conductivity—dielectric units and thickness, compression and recovery gages. Custom Scientific Instruments, Inc. **(I-911)**

**INJECTION MOLDING MACHINE.** Data sheet describes an injection molder with capacity of 6 to 10 ozs. per shot and plasticizing capacity of 100 lbs. Fellows Gear Shaper Co. **(I-912)**

**SLITTING LEVERS.** 4-page brochure illustrated with mechanical drawings describes a hardened slitting lever with a 3 inch diameter, .748 bore knife, lever holders for cuts above 1 inch and plate spacers for cuts under 1 inch. John Dusenbery Co., Inc. **(I-913)**

**INJECTION MOLDING MACHINES.** Illustrated data sheets describe a parting line automatic molder, a vertical automatic molder, a semi-automatic indexing molder and 3 and 4 ounce molders. Guy Harvey & Son Corp. **(I-914)**

**SLITTING & REWINDING MACHINES.** Illustrated 8-page brochure describes an extensive line of slitting and rewinding machines, slitting and spooling machines and a high-speed shredder. 4-page brochure describes four slitting and rewinding machines, a laminating machine, a granulating machine and a stretching plant. Inta Roto Corp. **(I-915)**

**STEAM TRAP.** Illustrated technical bulletin describes a steam trap for pressures from 10 to 600 psi, having only one moving part. Trap sizes ⅜, ½, ¾ and 1 inch. Table of capacities of each at saturated steam temperature and 30° below steam temperature. Sarco Co., Inc. **(I-916)**

**MOLDING PRESSES.** Illustrated 8-page brochure describes a line of molding presses in 60, 75, 100, 150, 175, 200, 300 and 450 ton capacities. Descriptions of components and table of specifications. Baker Brothers, Inc. **(I-917)**

**COSMETIC AND PHARMACEUTICAL CHEMICALS.** 76-page catalog on esters for use in cosmetics and pharmaceuticals. Sections on: specifications and physical properties; technical data; application data. Kessler Chemicals. **(I-918)**

**CIRCULAR SAW BLADES.** Two data sheets describe circular saw blades for plastics in alloy-tipped and thin-kerf types. 6 to 18 inch diameters. Price lists and specification tables. Radial Cutter Mfg. Corp. **(I-919)**

**VIALS AND JARS.** Illustrated 4-page brochure describes an extensive line of transparent plastic vials and jars, rigid and flexible, threaded and shell. Data sheet on clock closure type. Price lists. Celluplastic Corp. **(I-920)**

**STEAM-JET CLEANERS.** Illustrated 6-page brochure describes a line of electrically heated steam-jet cleaners for machinery. Atomizes and mixes cleaning agent with steam. Specifications. Pantex Mfg. Corp. **(I-921)**

**LABORATORY EQUIPMENT.** Illustrated 4-page brochure describes a line of laboratory machinery for the plastics industry, including a mixer, calender, 1-inch extruder, vulcanizing pan, steam heated press, hydraulic autoclave and vacuum drying oven. Francis Shaw & Co., Ltd. **(I-922)**

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**METHYL BUTYNOL, METHYL PENTYNOL.** 60-page booklet discusses, with tables, formulae and descriptions, the physical properties, storage and handling, toxicity, methods of analysis, chemical properties and applications of the above tertiary acetylenic alcohols. Air Reduction Chemical Co. **(I-924)**

**MOLDING PRESSES.** Illustrated 4-page brochure describes a series of vertical molding presses in capacities of 100, 150 and 200 tons. 5-speed cycle, 3 closing and 2 opening. Up-moving model optional. Mechanical drawings, specifications. Erie Foundry Co. **(I-925)**

**PLASTIC KNOBS.** Illustrated 16-page catalog describes a line of knobs made of any thermosetting plastic. Includes gear and control balls, and utility and lid, pointer and bar, H-D and G-P instrument, lever, dual control lever, crank handle and spinner knobs and vernier dial assemblies. Kurz-Kasch, Inc. **(I-926)**

**EPOXY RESINS.** Six technical bulletins, titled: Epoxy Resins and Hardeners, Epoxy Resin Hardeners, Liquid Epoxy Resin (three, on different types), and Flexible L.E.R. (Heat Cure). Reichhold Chemicals, Inc. **(I-927)**

**SPEED INDICATORS, TIMERS.** Two bulletin sheets. One describes three speed indicators with ranges up to 30,000 RPM, with and without chronometric features and with a variety of tips. Other describes two interval timers offering minute-and-second combinations up to one hour or 1-to-120 minute range. Ivan Sorvall, Inc. **(I-928)**

**VACUUM METALLIZING COILS.** 8-page specification booklet covers a line of tungsten coils which include types suitable for practically every vacuum plating operation in commercial use. Sylvania Electric Products, Inc. **(I-929)**

**REINFORCED PLASTICS PRESSES.** Illustrated 4-page brochure describes a line of presses for reinforced plastics in capacities of 25, 50, 75, 100, 150, 200, 300, 400, 500 and 6600 tons. 4-speed cycle. Table of specifications. Dake Corp. **(I-930)**

**PLASTICS MOLDING.** Illustrated 12-page booklet discusses questions of taper, wall thickness, strengthening devices, threads, parting line, inserts, holes, knurling, ejectors, tolerances, fillets and radii in mold designing. American Insulator Corp. **(I-931)**

**INJECTION MOLDING MACHINES.** Illustrated 8-page brochure describes a line of injection molders with plasticizing capacities of 130 to 350 lbs. per hour. Choice of 20,000 and 30,000 plungers, interchangeable. Two-speed injection control. National Automatic Tool Co. **(I-932)**

**PVC RESINS, WAXES.** Series of technical data sheets describe a low, medium and a high molecular weight PVC resin, a wax designed to prevent sun checking of natural and synthetic rubbers, high melting point synthetic waxes and Gilsonite compounds. Cary Chemicals, Inc. **(I-933)**

**THERMO-PLASTIC EXTRUDER.** Illustrated 4-page brochure describes an extruder offering controlled pressures up to 10,000 psi., in sizes of 1½, 2½, 3½, 4½ and 6 inches, with L/D ratio of 21:1. Johnson Machinery Co. **(I-934)**

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**FLUOROCARBON SEALS AND BEARINGS.** 16-page catalog describes a line of Teflon and Kel-F packings, V-rings, seals, diaphragms, bearings, liners, etc. valves and pumps. Gives general, chemical and physical properties of the materials, specifications of products. Garlock Packing Co. **(I-936)**

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**POLYETHYLENE HOUSEWARES.** Two 4-page brochures and four catalog sheets, illustrated, describe a line of polyethylene household utility articles, kitchen and general, and refrigerator-to-tableware. Idealware, Inc. **(I-938)**

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**PLATEN PRESSES.** 6-page illustrated brochure describes lines of 4-column hydraulic presses for plastic molding, die try-out, general use. Power units range from 5 to 25 HP. Machine & Tool Div., Lempco Industrial, Inc. **(I-940)**

**ELECTRIC CARTRIDGE HEATERS.** Illustrated catalog sheet describes features of a line of electric cartridge heaters for stud heating, stress-relieving, extruding metals, and metal forming. Includes specifications, prices. Edwin L. Wiegand Co., Inc. **(I-941)**

**VINYL SOLUTION RESINS.** 16-page booklet discusses preparation, properties and compounding of Geon solution resins for paper coatings, food packaging, strippable coatings, printed inks, etc. B. F. Goodrich Chemical Co. **(I-942)**

**CONVEYORS.** Companion illustrated brochures describe and give case histories of a roller conveyor with automatic elevator, a chain conveyor, roller and incline-pusher conveyors, vertical conveyors, etc. C. M. Wilkinson Co. **(I-943)**

**AUTOMATIC INJECTION PRESSES.** Illustrated literature describes 2½-, 3-, and 4-6-oz. automatic injection presses. Units feature up to 720, 1200 and 840 cycles per hr., respectively. The Van Dorn Iron Works Co. **(I-944)**

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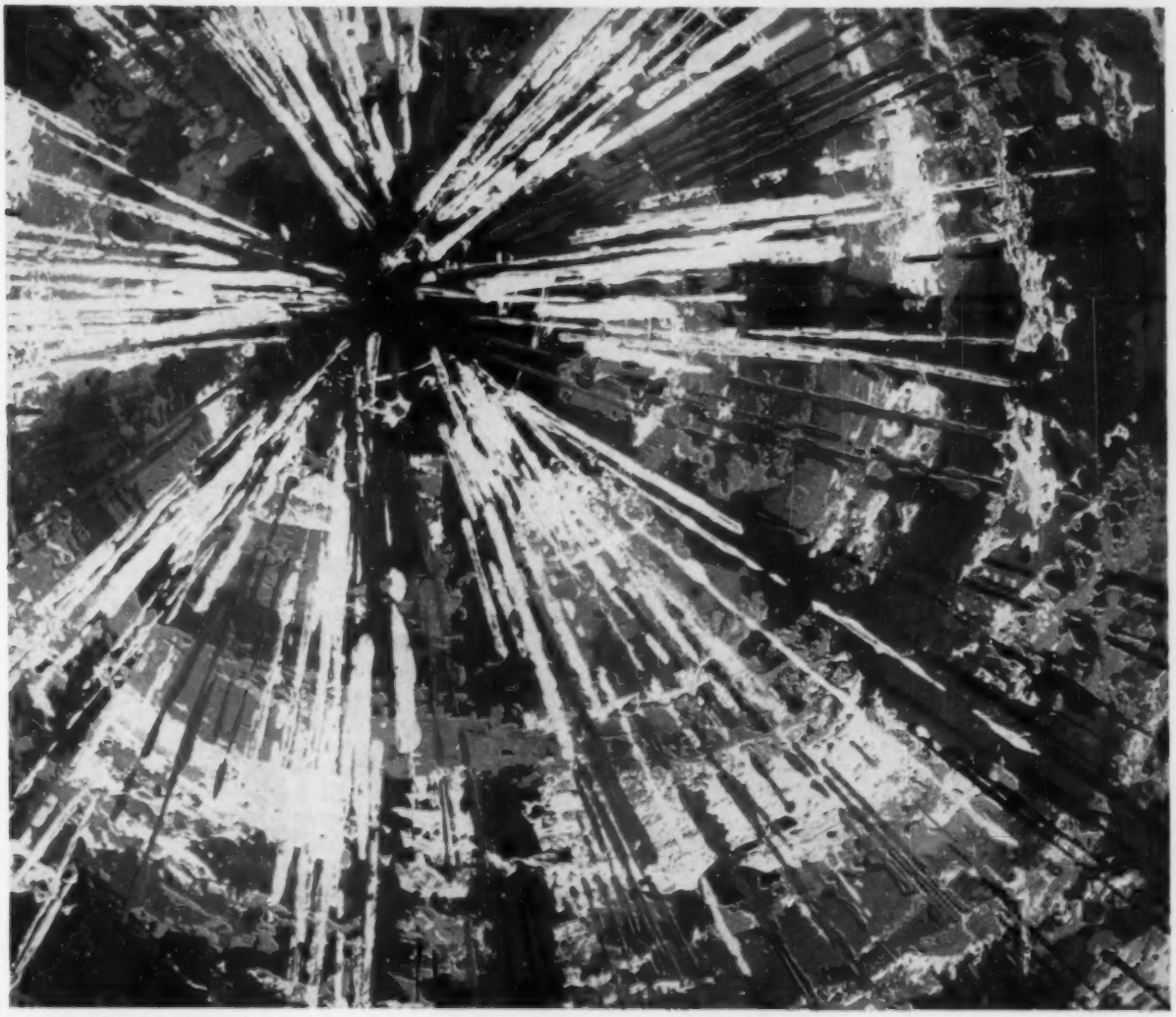

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over 100 lb. per plane, the design imposed a burden on the molder, since seven different layers of glass cloth had to be assembled and bonded together, each of a different width and configuration. Swedlow Plastics Co., Los Angeles, Calif., designed a complex sequence of uniform parts meeting the specifications.

Swedlow receives the B-stage preimpregnated glass cloth in strips already cut to width for the various laminations that make up the hat section. These are kept in cold storage until used. A succession of medium - temperature forming dies are used to shape the strips into their basic configurations. No curing is done at this time, only slight "setting" action.

One of the more troublesome parts of the assembly has been a small No. 5 glass-cloth sleeve (approximately 1/10 in. in diameter) that is used to reinforce the base corners of the hat section. To hold these in place during final cure, Swedlow sews the sleeve into the corners of one of the pre-formed strips. Liquid resin is used to load the sleeve; otherwise only preimpregnated materials are used.

The laminate with the sewn sleeve is assembled with the other strips and the whole unit is then placed in a matched steel die that can mold four lengths at a time. The die is almost, but not completely, closed in order to provide a "dwell time" that allows the volatiles in the cloth to escape. After a dwell time that varies from a few seconds to two minutes or more, the die is completely closed and full pressure applied. Swedlow is using a double press with a total capacity of 170 tons. Cure temperature is between 240 and 275° F., depending on the age of the resin. Cure time is 12 to 20 minutes.

The formed sections are placed in a gas-fired oven for a post-cure of 3 hr. at 400° F., or 4 hr. at 350° F. The sides are then trimmed with 3 - in. diamond coated saw blades, and the lengths are ready for final inspection.

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of a Sheet Manufacturing Plant

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## Injection molding

*(From pp. 105-111)*

as far as flow in the cavity is concerned, it makes no difference what the delivery rate of the press is, or how rapidly the press achieves the set pressure, as long as the set pressure is reached or closely approached before the wave front penetrates the cavity. If the previous channels are not isothermal then the temperature (and thus the pressure) entering the cavity will depend upon these press characteristics. Although both die control and machine control are described by Eq. 19, their characteristics would be expected to be quite different, for in the case of machine control $P_r$ increases with time and when the die controls $P_r$ is a constant.

Finally, some consideration of the application of Eq. 16 to the cylinder of an injection molding machine is needed. In steady cycle operation a mass of solid polymer particles is forced into the cylinder to replace an equal mass forced out of the nozzle into the die. Since the capacity of the cylinder is large compared to the size of the shot, most of the heating of any particular charge takes place after the cycle in which the charge entered the cylinder and, although the polymer in the cylinder is not isothermal, its mean temperature is not changing significantly during flow. Thus, there should be an effective resistance of the molten material in the cylinder which, although it may depend upon the time average flow rate in the cylinder, will not vary strongly with time during a shot except in long-flow molds where filling time is a large part of the total cycle.

However, if the solid particles forced into the cylinder do not melt immediately, there will be a pressure drop through the solid zone which is not velocity-dependent and does not follow the rheological laws which have been considered. This pressure drop is due to sliding friction between the particles and cylinder wall and is proportional to the applied pressure (5, 1). Therefore the pressure transmitted to the molten polymer is a constant fraction of the ram pressure and if a solid

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"How deeply have *Japanese* plastic materials penetrated the American market?"

"Why are epoxy resins especially recommended in *casting compositions* for use in encapsulation and potting of electrical and electronic components?"

"How are the styrene blends affected by strong acids?"

"What markets have opened up for *vinyl plastisol* materials?"

"What *special techniques* and formulations have been developed for the foaming of reaction-type phenolic resins?"

"What *printing method* is most commonly used in producing printed packaging films? And why is there a swing toward this process among decorators of light-gage polyethylene?"

"In reinforced plastics, what are the pros and cons of *matched-metal die molding?*"

"Where can you purchase electronic heat sealing machines?"

"Who are some custom molders and extruders around Cincinnati?"

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zone is present, $P_r$ in all the previous equations must be interpreted as this transmitted pressure.

**The experimental problem**

The earlier outline of the problem of filling a cavity showed that the instantaneous velocity depended upon both flow-front position and time. Thus, as opposed to steady flow in a filled channel where mean velocity is the only gross dependent variable, here the variables are mean velocity and wave front position and they are related through time by the definition of velocity

$$V = \frac{dX}{d\theta} \qquad \text{Eq. 22}$$

It is found that the curvature of the wave front is small and relatively constant so the above definition is unambiguous and, since the compressibility of polymers is small, the wave front velocity can safely be taken as the mean velocity at all points at the same time. A number of important relationships follow immediately. Length of channel filled at any time is

$$X = \int_0^{\theta} V d\theta \qquad \text{Eq. 23}$$

and the maximum length which can be attained in a long channel, the fill-out, is

$$X_f = \int_0^{\infty} V d\theta \qquad \text{Eq. 24}$$

The time for the wave front to reach any point is

$$\theta = \int_0^{X} \frac{dX}{V} \qquad \text{Eq. 25}$$

and the time to fill a cavity of length $X_L$ is

$$\theta_L = \int_0^{X_L} \frac{dX}{V} \qquad \text{Eq. 26}$$

Thus, a number of different variables could be measured, all of which are capable, in principle, of being related back to the fundamental rheological and system properties. If, for example, the ram pressure and cylinder temperature are high enough, the wave front will reach the end of a channel in the time $\theta_L$ and this time would give a description of the flow in that channel.

Suppose, however, that a cer-


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# Planning for Economical Molding

## Operation — Pencil Sharpening

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tain combination of pressure and temperature was determined which would fill a particular channel and then a new run was made under these same conditions with a longer channel. Because of heat transfer, there is some channel length great enough so that the flow will never reach the end of the channel. Thus, if a series of runs, in which $X_f$ is varied from zero to $X_L$, are made in a particular cavity, then the fill-out gives the conditions under which a cavity of length $X_f$ would just be filled. If certain conditions give a fill-out of $X_f$, then if the cavity were shorter than $X_f$ and the same operating conditions were used, the velocity-distance relationship would be the same in both cases until the wave front reached $X_L$, at which point the flow would be stopped. (We assume here, and hereafter, that all the channels would be so well vented that the flow would not be influenced by trapped air. Care was taken in this work to see that this condition was achieved.)

If the fill-out alone were measured it would give information concerning the limiting conditions of operation for all cavities shorter than $X_L$, but if the velocity or distance were measured as a function of time for runs in which $X_f$ varied from zero to $X_L$, a description of *all* possible flows in *all* channels with lengths equal to or less than $X_L$ would be obtained. The latter measurements allow comparison of instantaneous velocities or distance with theory, but a measure of $X_f$ alone only allows a comparison with the time integral of velocity

**References**

1. C. E. Beyer, R. R. Dahl, R. B. McKee, Modern Plastics *33*, No. 4, 127 (1955).

2. J. Eveland, H. J. Karam, C. E. Beyer, SPE Journal *12*, No. 5, 30 (1956).

3. O. M. Hahn, SPE Journal *13*, No. 7, 25 (1957).

4. R. S. Spencer, G. D. Gilmore, J. Colloid Science *6*, 118 (1951).

5. R. S. Spencer, G. D. Gilmore, R. W. Wiley, J. Appl. Physics *21*, 527 (1950).

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**Next month: test equipment, experimental procedure, and results.**

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51-9


## Premix

*(From pp. 112-122)*

strength of premix, are likely to be unattainable on small parts where the working surfaces usually control the amount of material needed rather than the strength of large area cross sections. Therefore, it can be assumed that the cost of small parts is likely to be considerably higher than it will be for the easier to handle powder-type compounds.

Some methods of attacking these problems can be employed to advantage. Multiple parts can sometimes be made from a single charge. In parts which can be designed for easy, fast removal of flash, the mold clearances can be opened up so that automatically cut-from-log charges can be used, since exactly controlled charge weight is considered to be not critical under such conditions.

It should be noted here that the high filler mixes are far more suitable for small parts than the high glass mixes because 1) flash removal is much easier with these low-glass-fiber-content materials; 2) they can be extruded into rope or logs of much more uniform weight because they are not springy and loose like the high-glass mixes; and 3) they cost less per cubic inch and hence are more suitable where the mass of the part is controlled by its space function as compared with its strength function.

### Mold maintenance

There is a prevalent feeling among the uninitiated that glass-filled molding compounds are necessarily hard on molds. The reasoning is logical enough; glass is highly abrasive and will, therefore, cause mold wear. The fact of the matter is that, provided reasonable care is exercised in the design, construction, and operation of molds for glass polyester premix, they should run for at least 100,000 shots without any need to rework the surfaces which come into contact with the molding compounds. (This comment is not meant to include guide pins, hinges, etc.)

There are, however, several key points to be considered:

1) Although molding pressures,

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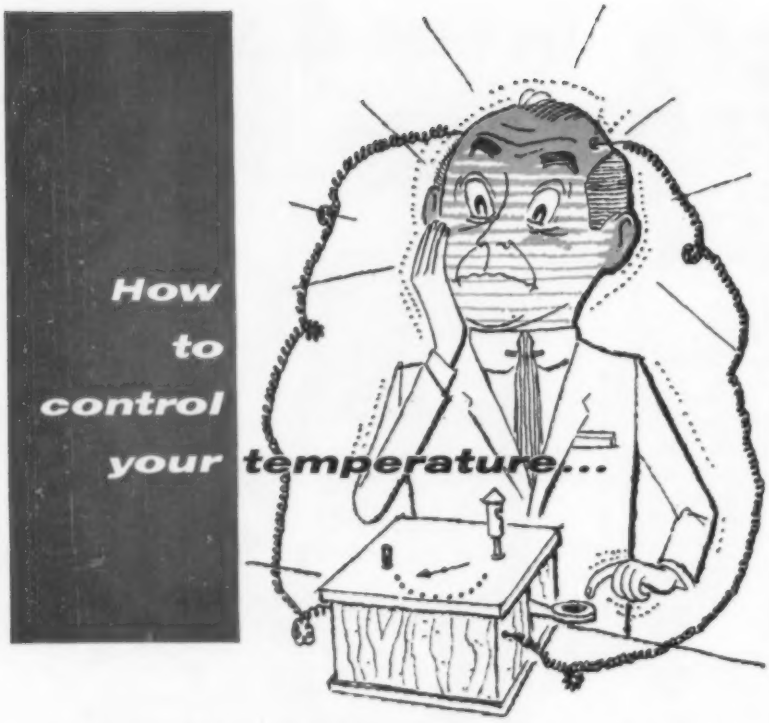


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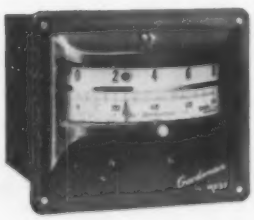

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lower than those for phenolics can be used to mold glass-polyester premix, and soft molds can be used without risk of cavity distortion, the soft molds are just as subject to damage from accidental or careless abuse. For this reason, hardened steel molds are especially recommended for premix production runs.

2) The telescoping fit of a positive or semi-positive mold is more subject to galling, especially in unhardened steel. This is caused by the scraping action of glass containing flash along the telescoping surfaces as the mold opens after each shot. This can be eliminated or reduced to a minimum by providing a slight (½° per side) draft on the telescoping portion of the cavity as seen in Fig. 39.

3) Landed or "kiss off" areas in the mold are subject to peening. This is usually from precured material or wads of glass fibers. Such landed areas should always be avoided, if possible, especially when one is using high-glass-content materials.

4) Small bleeders or vents will open up rapidly if much material flows through them. These should be avoided if possible, and where they are required, a design permitting easy maintenance should be worked out when the tooling is built.

If the above precautions are observed, the molder should experience little difficulty with excessive mold wear with these materials. Many parts, such as the caps seen in Fig. 44, have run 50,000 shots and some have run over 100,000 shots without reworking the mold surfaces. The effect of mold maintenance costs on piece prices can be assumed to be slight.

**Conclusion**

*This series of articles has presented the lessons learned by a major premix molder in overcoming the various problems presented by the material. Through painstaking research the authors have developed, and presented in these articles, a detailed and practical guide that will benefit molders, designers, material makers, and others interested in premix materials.*—Ed.

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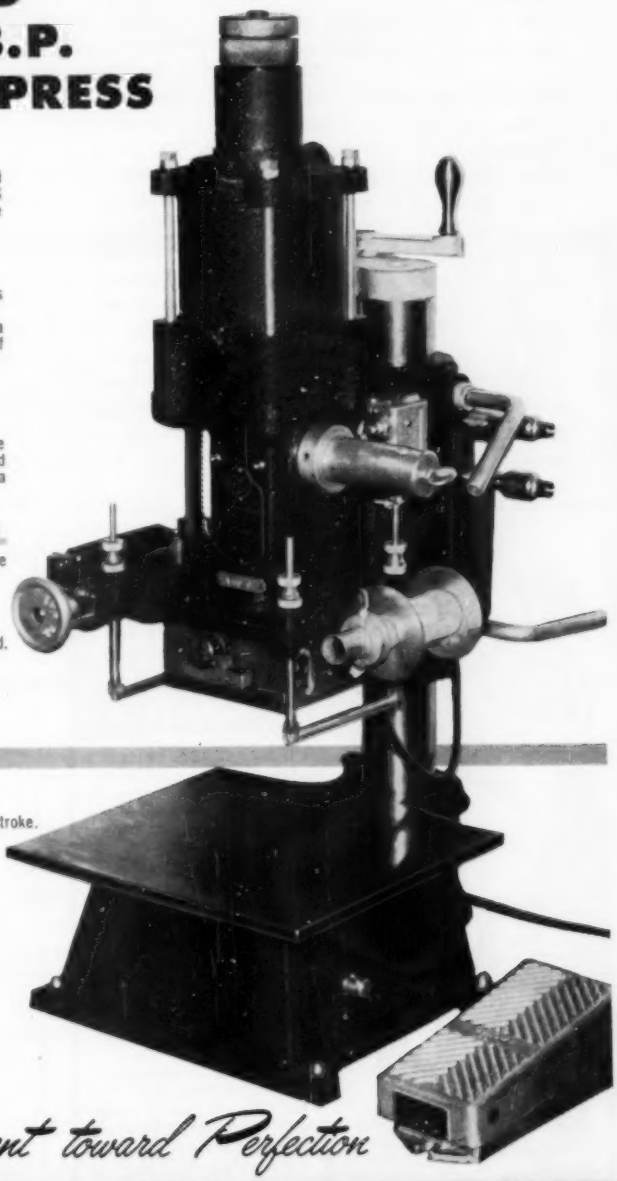

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## Coupling agents

*(From pp. 125-132)*

low molecular weight copolymers, probably liquids, which would add little to the over-all strength.

3) The adhesion of the silane to the glass via the adsorbed water layer may be the limiting factor in resin-glass adhesion, and a more complete copolymerization of the vinyl groups in the siloxane sheath covering the glass would have a relatively small effect on the over-all resin-glass adhesion.

### Conclusions

The information presented in Tables II, III, and IV is not extensive enough to warrant sweeping conclusions, but these data appear to indicate the following:

1) As has been suggested by others, the epoxy resin probably reacts with the glass or, more correctly, reacts with the water film on the glass surface. Certainly an epoxide should be as reactive with water as with the reactive groups in the average hardener. The high retention of strength of the epoxy laminates made with heat-cleaned glass and no coupling agents after the 2 hr. in boiling water indicates such a chemical bonding.

In the case of polyesters, which also give high-strength laminates with heat-cleaned glass when tested under dry conditions, such laminates are highly degraded by the 2-hr. immersion in boiling water. It is difficult to see how a polyester, under free radical catalytic conditions, would react with the glass surface water film.

2) The substantial decrease in strength of epoxy laminates after 7 days' immersion in boiling water was as great for laminates containing a finish on the glass as when no finish was used. This indicates a hydrolytic breakdown of the resin-glass bond. The epoxy laminates having the glass finish do, however, hold up much better in the 170° F. water immersion test under stress. At this temperature less "hydrolysis" will occur, and the presence of the coupling sheath around the glass apparently resists creep and thereby slows the penetration of water to the glass surface.

3) It may be noted that the polyester cited in Table III has outstanding resistance to water. According to the manufacturer, Atlac-382 is "a fumaric acid ester of an alkylene oxide condensate of bisphenol-A." Why does this polyester have considerably better moisture resistance than do those polyesters that are based on maleic anhydride and an ethylene glycol? An explanation which has been offered is that bisphenol-A goes into its manufacture and because of this, "it is somewhat like the epoxies." This hardly appears to be a likely explanation. It is doubtful if there is anything magic about the use of bisphenol-A. Atlac-382 is probably highly resistant to water for many reasons, chief of which is its relatively high molecular weight and high carbon to oxygen ratio. It isn't true that polyesters have poor water resistance—they can be compounded and cured to give highly moisture resistant laminates.

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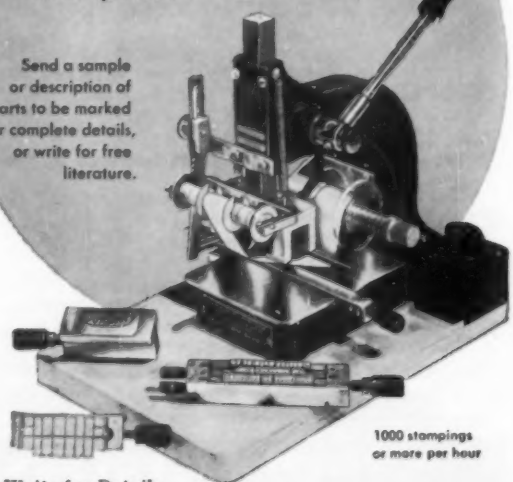

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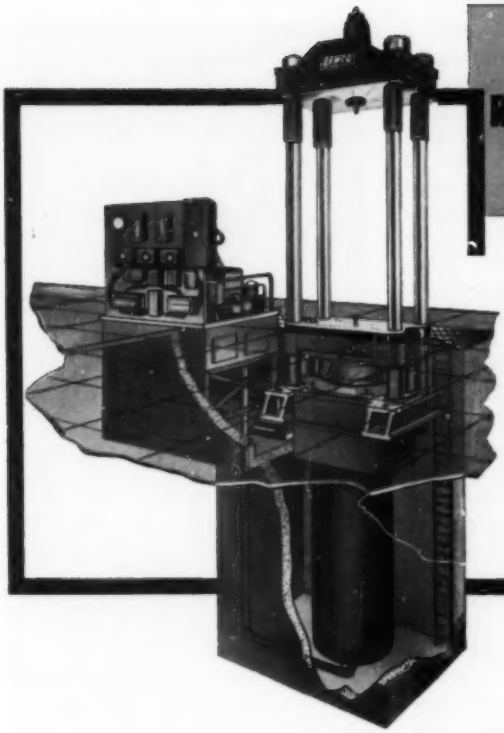

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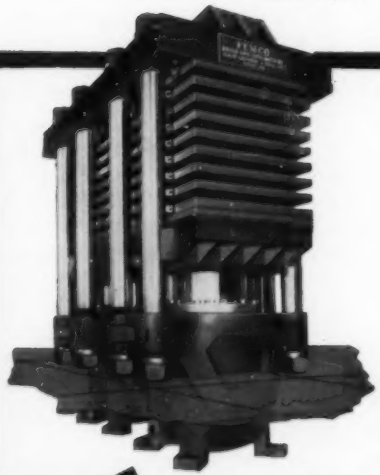

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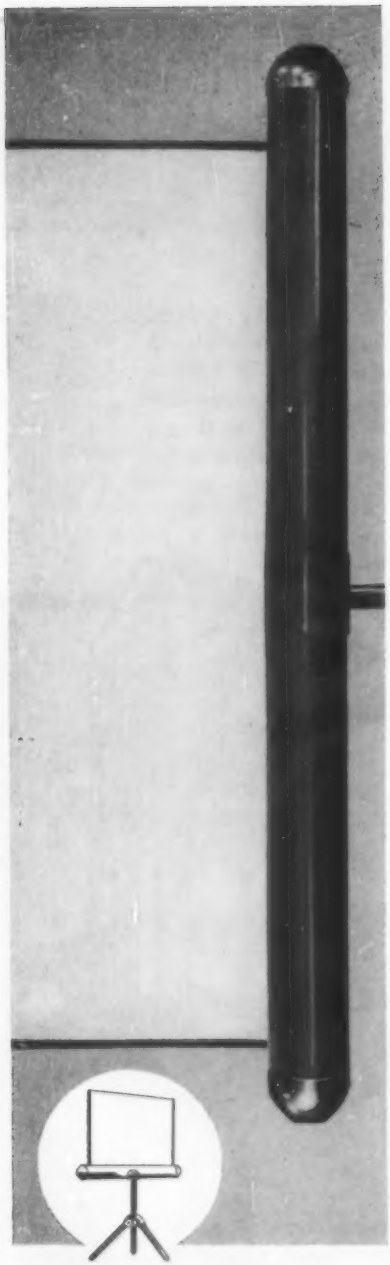

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the behavior of a polyester, a highly polar material, with that of C-oil, a nonpolar resin, relative to their response to the use of vinyl silane in glass-resin laminates. Both resins were employed in these studies with peroxide catalysts and as 60/40 and 50/50 blends with vinyltoluene. a). In the absence of a coupling agent, the polyester wets the glass much better than does the hydrocarbon-type resin and results in laminates of higher flexural strength. However, both fail badly when immersed in hot water. b). Once a vinyl silane is present, either in the resin or on the glass, the two resins, although quite different in chemical structure, have similar properties as to dry strength at room temperature. Each is likely linked to the siloxane coupling agent via vinyltoluene copolymerization and this common part of the laminate structures might be the weakest link. The siloxane sheath and the polysiloxane-glass bond are also common in the two structures and one of these may be the limiting factor. c). The C-oil resin laminate containing the silane has much better resistance to boiling water than does the polyester in which the silane is added via the resin. This is thought to be due to the adsorption of the silane from the hydrocarbon resin by the glass to a higher degree than from the more polar polyester resin. Once the silane is adsorbed on the glass surface, the ester groups of the silane are probably hydrolyzed, at least in part, by the water film on the glass. If extensive hydrolysis occurs, the silane should be attached to the glass in a manner similarly as when applied to the glass as a finish.

Work is continuing at Esso Research and Engineering Co. on the role of the coupling agent with particular attention to the use of polybutadiene-type thermosetting resins. Copolymerization of vinyl triethoxysilane with styrene and with fumarate esters, respectively, using different catalysts is also being studied in some detail. References cited exemplify information in the literature and are not necessarily the most pertinent.

The author is indebted to a number of his associates at the Esso Research and Engineering Co., who have cooperated in the carrying out of experiments and evaluation tests. Thanks are due to Prof. E. G. Rochow of Harvard University for several discussions on the behavior of organic silicones. Support by affiliates of the Standard Oil Co. (N. J.) is also greatly appreciated.

**References**

1. J. Bjorksten, L. L. Yaeger and J. E. Henning, "Polyester resin-glass fiber laminates," Ind. Eng. Chem *46*, 1632 (1954).

2. J. Bjorksten and L. L. Yaeger, "Vinyl silane size for glass fabric," Modern Plastics *29*, 124 (July 1952).

3. F. J. McGarry, "Resin-glass bond characteristics," S. P. I. Preprint, 13th Annual Meeting of the Reinforced Plastics Division, Section 11-B (1958).

4. H. Clark and B. M. Vanderbilt, "A new hydrocarbon thermosetting resin for reinforced plastics," S.P.I. Preprint, 14th Annual Meeting of the Reinforced Plastics Division, Section 17-C (1959).

5. R. Y. Mixer and D. L. Bailey, "The mode of peroxide-catalyzed polymerization of vinyl triethoxysilane," J. Polymer Sci. *18*, 573 (1955).

6. G. H. Wagner, D. L. Bailey, A. N. Pines, D. L. Dunham and D. B. McIntire, "Reactions of vinyl trichlorosilane and vinyl triethoxysilane," Ind. Eng. Chem. *45*, 367 (1953).

7. B. R. Thompson, "Copolymerizations of vinyl silanes," J. Polymer Sci. *19*, 373 (1956).

8. R. S. Treseder, "Laboratory testing of glass-plastic laminates," Corrosion *10* (7), 18 (1954).

9. J. H. Plummer and C. F. Neumeyer, "A new coupling agent for glass fiber roving polyester products," S.P.I. Preprint, 9th Annual Meeting of the RP Division, Section 28 (1954).

10. N. M. Trivisonno, L. H. Lee, and S. M. Skinner, "Adhesion of polyester resin to treated glass surfaces," Ind. Eng. Chem. *50*, 1912 (1958).

11. G. W. Morey, "The properties of glass," 2nd Edition, Reinhold Publishing Corp., New York (1954).

12. E. G. Rochow, private communication.—**End**

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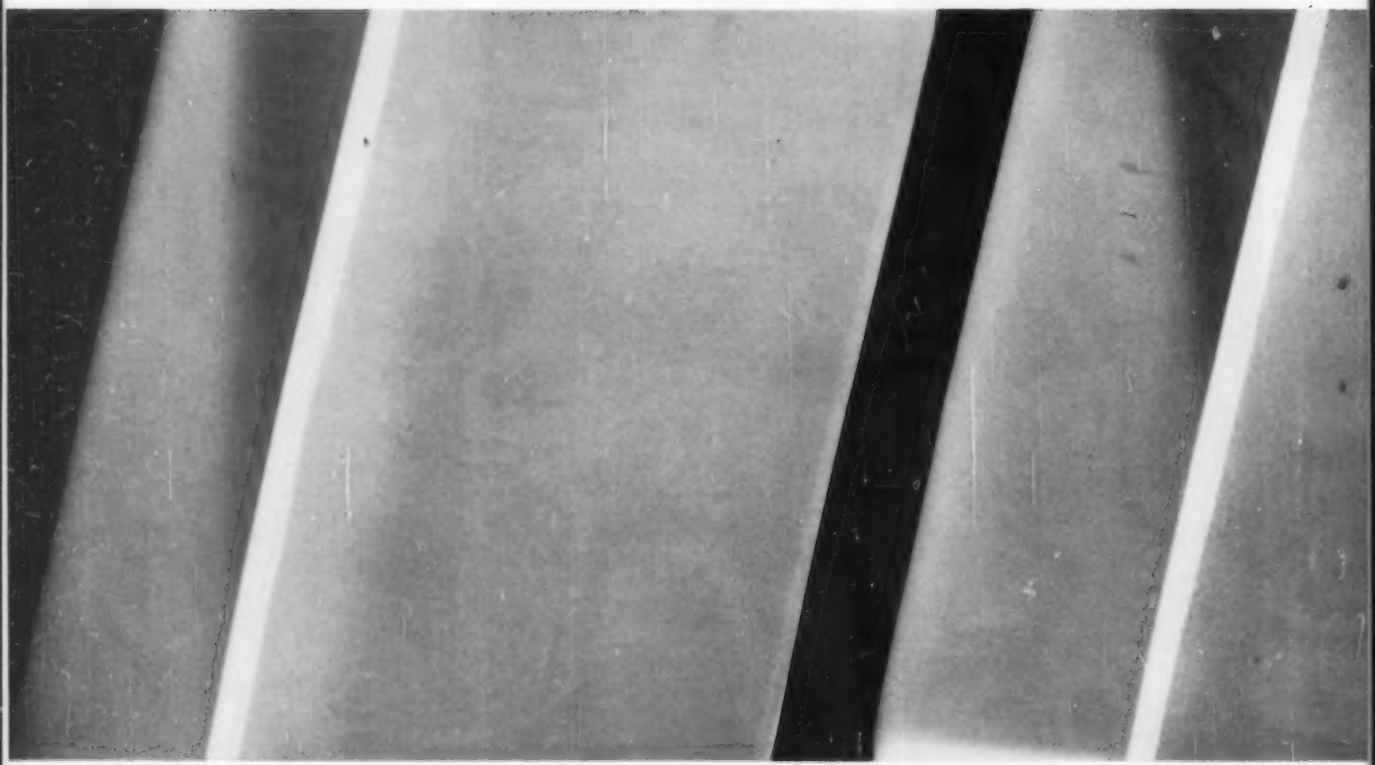

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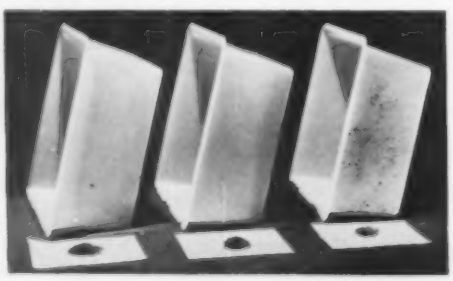

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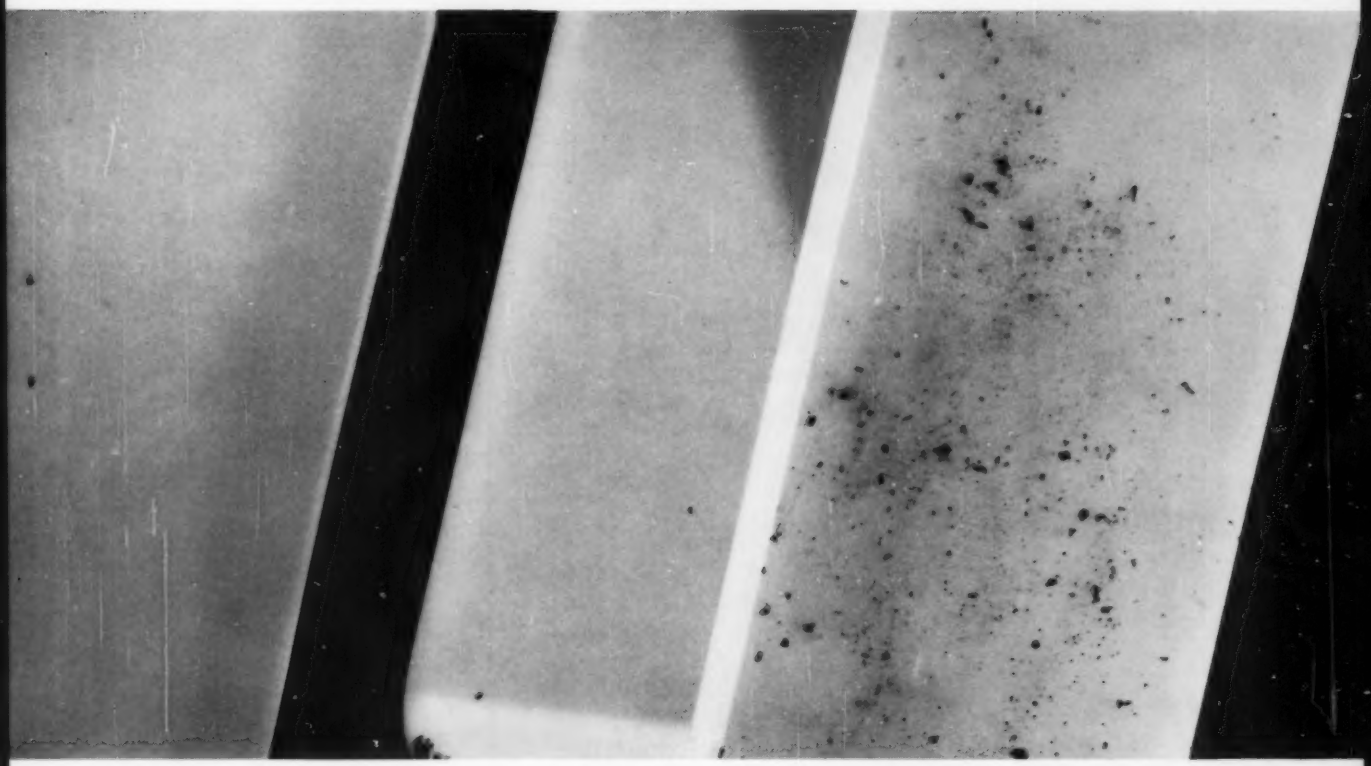

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**TYPICAL PROPERTIES**

| | DPD-7366 | DNDA-0401 |
|---|---|---|
| Melt index g/10 min | 8 | 25 |
| Secant modulus, psi at 23°C | 40,000 | 29,000 |
| Tensile strength, psi | 1600 | 1420 |
| Elongation, % | 210 | 134 |
| Yield strength, psi | 1500 | 1320 |

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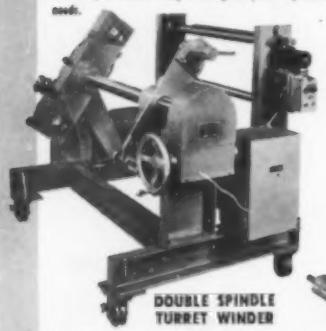

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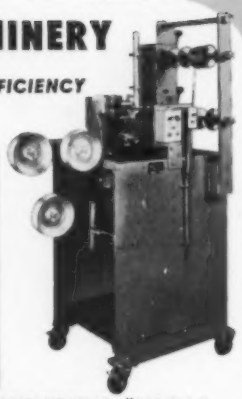

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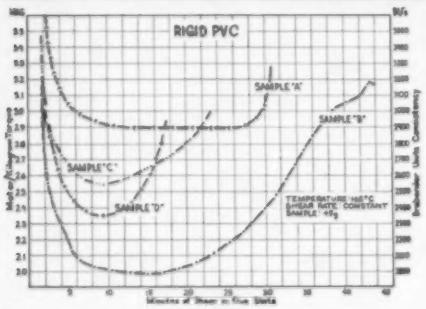


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## Polystyrene

*(From pp. 134-140)*

factors. These extruded parts were then exposed in a Fadeometer in accordance with the property specifications for polystyrene used in fluorescent luminaires.

Test data illustrated in Fig. 6, p. 140, show no significant differences in yellowing characteristics through 500 hr. of Fadeometer exposure regardless of stock temperature. In fact, little yellowing occurred in the initial 500 hr. exposure. However, the portion of the curves beyond the 500-hr. exposure time indicates that the polymer yellows or degrades more rapidly with increases in stock temperature. This trend would be expected since antioxidants and UV screeners incorporated in polystyrene to resist yellowing will volatilize from the polymer more readily at higher temperature. Since polymer degradation during fabrication will result in loss of useful life and also in a loss of physical properties, the following fabrication recommendations should be observed when producing general-purpose, light-stabilized PS:

*Injection molding*

1. Maintain cylinder temperatures as low as is practical. This is best accomplished by operating within 80% of machine capacity.
2. Use maximum injection pressure for best overall part strength.
3. Maintain a constant cycle with as few delays as possible to avoid overheating the material.
4. If a delay is necessary, run several purge shots to remove overheated material.

*Extrusion*

1. Use stock temperatures in the range of 360 to 400° F.
2. Utilize minimum extruder inventory time.

Both polystyrene producers and fabricators alike play an important role in the production of the final product, a lighting fixture capable of a long service life. It is the producer's responsibility to provide a quality light-stabilized material. It is the fabricator's responsibility to fabricate this material correctly. If these two requirements are met, polystyrene will have increased use as a lighting fixture material.—**End**

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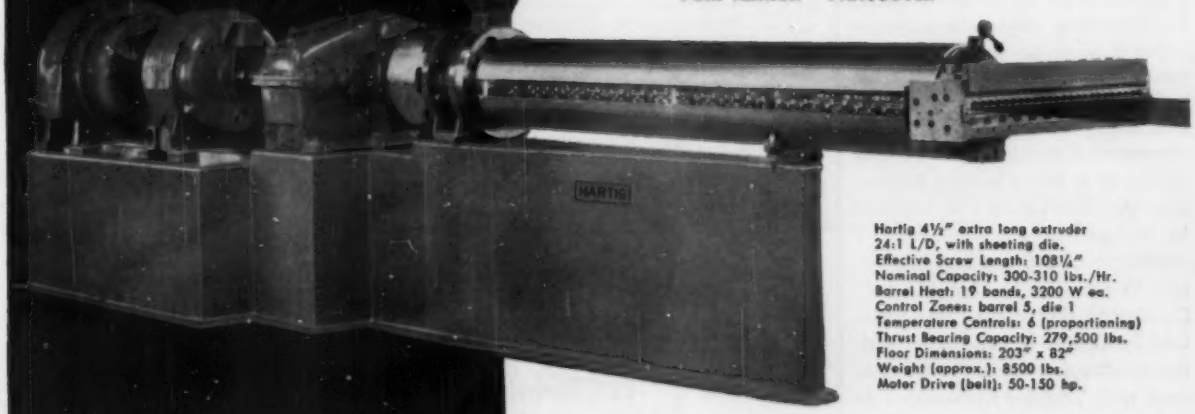

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24:1 L/D, with sheeting die.
Effective Screw Length: 108¼"
Nominal Capacity: 300-310 lbs./Hr.
Barrel Heat: 19 bands, 3200 W ea.
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Temperature Controls: 6 (proportioning)
Thrust Bearing Capacity: 279,500 lbs.
Floor Dimensions: 203" x 82"
Weight (approx.): 8500 lbs.
Motor Drive (belt): 50-150 hp.

## Recommended

*(From p. 142)*

conditions recommended by the material supplier and should conform to the requirements listed in Table I, p. 142.

The compound should be sampled in accordance with the sampling procedure described in the Methods of Testing Molding Powders used in Manufacturing Molded Electrical Insulators (ASTM Designation D392). A batch of compound should be considered as a unit of manufacture as prepared for shipment and may consist of two or more "production runs" of material.

### Test methods

The following are the recommendations and the test methods for determining the illumination characteristics:

1. For those tests where conditioning is required, the molded test specimens should be conditioned in accordance with Procedure B of the Methods of Conditioning Plastics and Electrical Insulating Materials for Testing (ASTM Designation D618).

2. Test conditions. Tests should be conducted in the standard laboratory atmosphere of 23° C. ±1.1° C. (73.4°F. ±2°F.) and 50±2 percent relative humidity, unless conditions are otherwise specified in the testing methods.

3. Stability toward yellowing: a) Apparatus. Fadometer (Type FDA-R) carbon arc accelerated aging device operated in accordance with procedures recommended in ASTM Recommended Practice E42-56 T at a black-panel temperature of 120° F., and a Hardy-type spectrophotometer. b) Specimen preparation. Specimens of 0.100 in. ±0.005-in. thickness should be prepared from material by injection or compression under conditions specified by the material supplier. c) Determination of stability toward yellowing. Specimens should be exposed in the carbon arc device for a minimum of 100 hr. for Class A and B and 500 hr. for Class C. Specimens should then be examined for degree of yellowness with the spectrophotometer in accordance with Test for Luminous Reflectance and Color **(To page 210)**


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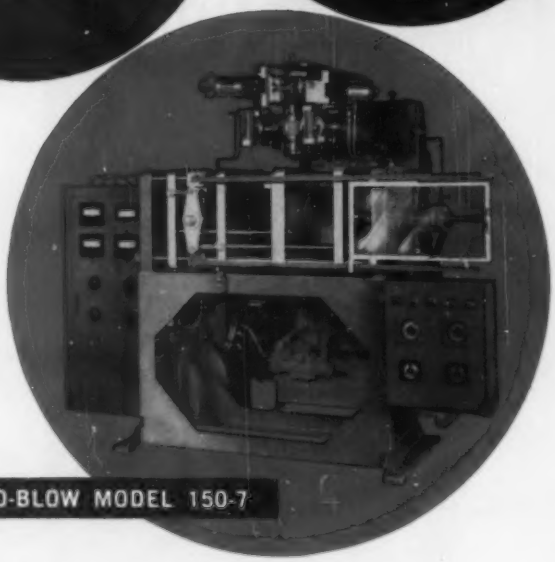

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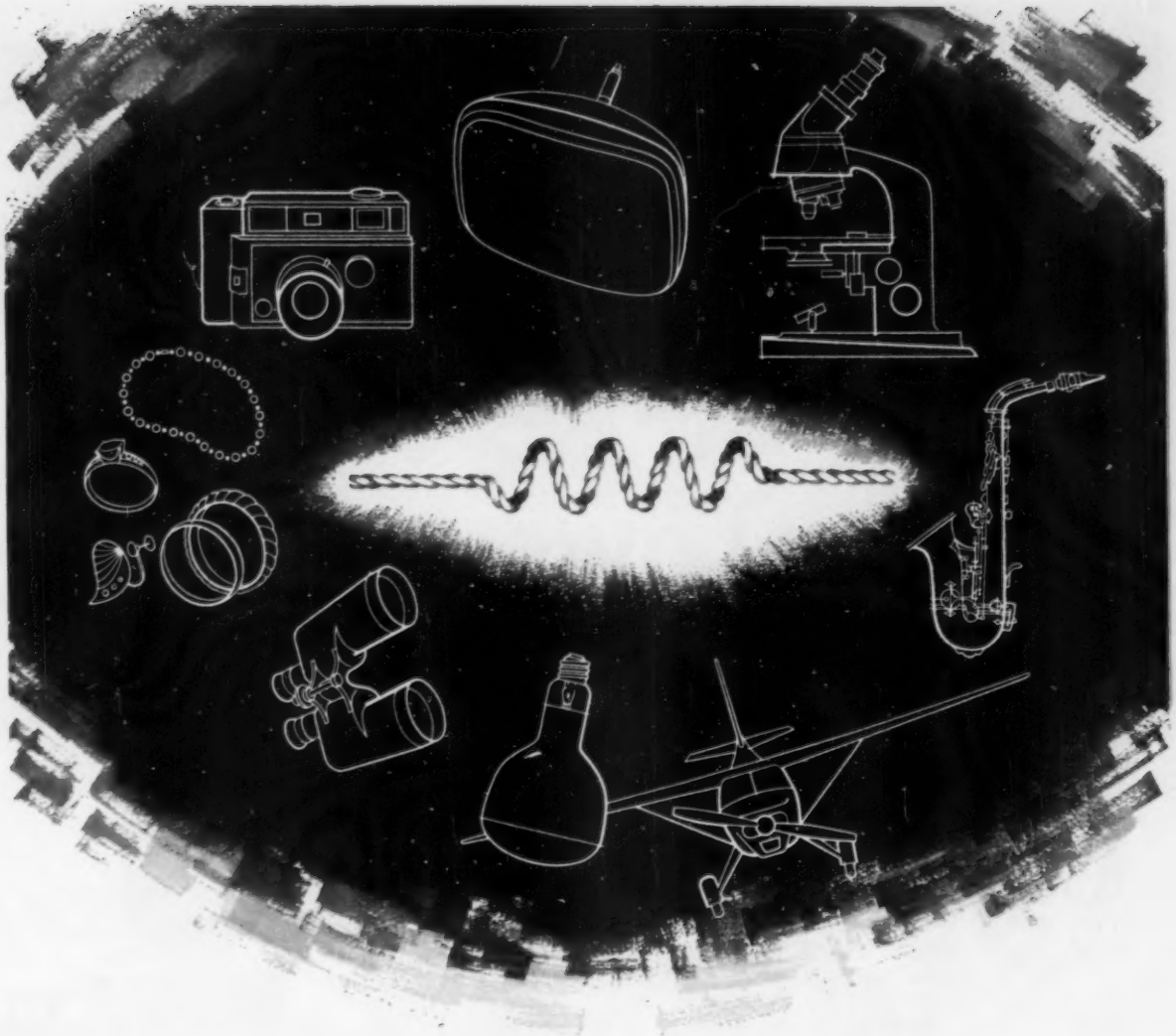

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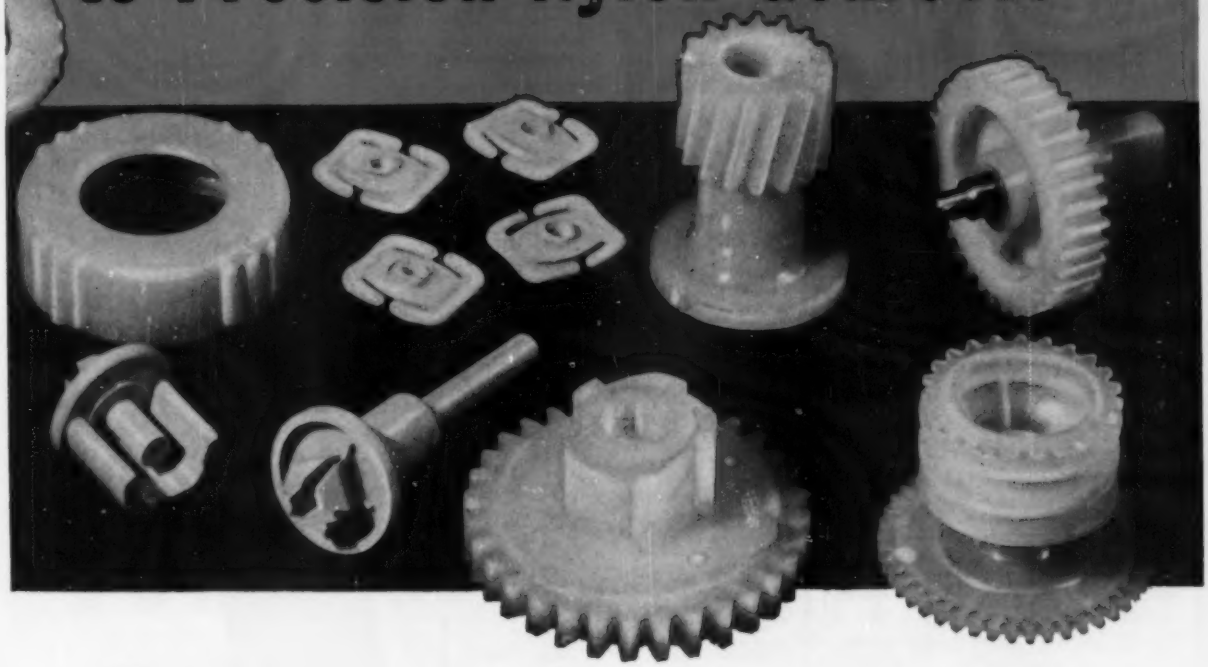

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of Materials (ASTM Designation D791) and this equation:

Yellowing factor $= 100 \frac{(T_{420}-T'_{420})-(T_{680}-T'_{680})}{T_{560}}$

where $T_{420}$ = percent transmission of same thickness of unexposed material at 420 μ.

$T_{560}$ = percent transmission of same thickness of unexposed material at 560 μ.

$T_{680}$ = percent transmission of same thickness of unexposed material at 680 μ.

$T_{420}$ = percent transmission of specimen at 420 μ.

$T_{680}$ = percent transmission of same thickness of unexposed material at 680 μ.

d) Tolerable yellowing. Specimens tested as above should be considered objectionably yellow if a yellowing factor of 15 is exceeded.

4. Refractive index. Methods of Test for Index of Refraction of Transparent Organic Plastics (ASTM Designation D542). Specimens should have a refractive index of from 1.585 minimum to 1.600 maximum at 23° C.

5. Regular light transmission. Standard Method of Test for Luminus Reflectance, Transmittance and Color of Materials (ASTM Designation D791), except that the specimen thickness shall be 0.100-in.±0.005 inch. The regular light transmission of specimens should not vary more than ±3 percent with pigmented compounds and ±2 percent with unpigmented compounds. Regular Transmission is defined in Fig. 1, p. 142.

5. Reflectance. Standard Method of Test for Luminous Reflectance, Transmittance and Color of Materials (ASTM Designation D791). The reflectance of specimens shall not vary more than ±3 percent.

One set of test specimens as prescribed in the methods of testing (see above) should be considered sufficient for testing. The average result for the specimens tested should conform to the recommendations made in the previous paragraphs. All of the tests listed, where applicable to the material, may be used to establish conformity of a material to these recommendations. It is recommended that routine inspection be limited to those tests required to identify the material to the satisfaction of the purchaser.—**End**


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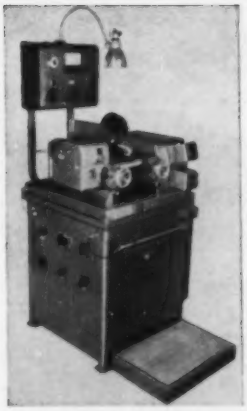

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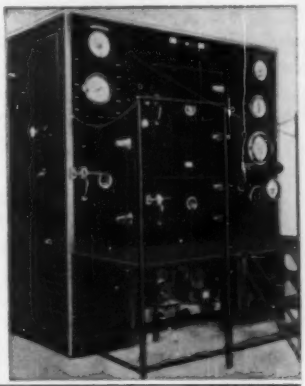

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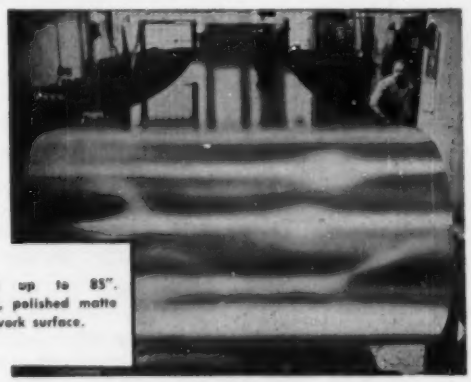

Widths up to 85". Smooth, polished matte finish work surface.

If you produce sheets, film, coated products, laminates, flooring, foam rubber or other flat work of plastic or rubber—investigate the cost-cutting, improved results being obtained with "Metalsmiths" Endless Stainless Steel Belts. "Metalsmiths" are specialists in stainless steel belt fabrication and application. Send details of your production requirements for engineering advice, without obligation. Metalsmiths, 558 White St., Orange, N. J.

**METALSMITHS STAINLESS STEEL ENDLESS CONVEYOR BELTS**

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# What membership in the SOCIETY OF PLASTICS ENGINEERS is doing for:

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# THE PLASTISCOPE*

News and interpretations of the news

By R. L. Van Boskirk

**Section 2** *(Section 1 starts on p. 37)*

**September 1959**

## Housewares—showcase for molded plastics

For a Gargantuan display of thermoplastic molding and an eye-opener on what's going on in the molding section of the plastics industry there is probably nothing to equal the semi-annual housewares shows. The recent Atlantic City, N.J., exhibit was a prime example. Here was competition in all its phases—both good and bad. Here one could find both shoddy and exquisite workmanship—the man who is out for a quick buck and he who has established a solid substantial business based on quality and integrity. Here is ingenuity in its better aspects.

Total dollar volume in the housewares business in the U. S. is estimated at over $700 million. Fifty-six percent of the members of the Housewares Manufacturers' Assn. reported that 1958 was their largest volume year despite the recession. All but 3% of those surveyed anticipated gains in 1959 of from 1 to 50%, with the largest portion (35%) anticipating 10 to 19% increases. Also, 33% of the buyers who were surveyed expected an increase of from 10 to 19% in 1959, but there were 12% who predicted a drop.

No one knows how much of this housewares volume is plastics. Only 12% of those who answered the survey listed themselves as primarily manufacturers of plastics products. But there is no telling how many others actually use plastics components.

### How much plastics?

A minimum guess at the volume of all plastics used in the total housewares field in 1958 is as follows (in pounds): polystyrene complete items, 32 million; polystyrene parts such as clock housings, kitchen tool handles, toilet seats, Christmas decorations, etc., 10 million; polyethylene, 75 million; melamine for dinnerware and appliance housings, 45 million; phenolic for handles, housings, vaporizers, toilet seats, 30 million; vinyl for shower curtains, coating for shelf or decorative paper, place mats, and other items must be at least 25 million; miscellaneous resins such as cellulosics, nylon, methacrylate, polyesters, and epoxy could be at least 5 million. This minimum total amounts to over 220 million lb. of resin with a sales value to the producer of around $70 million when figured at 1959 prices.

*Reg. U.S. Pat. Off.

### Polyolefins moving in

Trying to point out the highlights of this show is like trying to persuade someone that filet mignon is better than a sirloin but there were at least three that struck this observer as particularly noteworthy: They were the influence that low pressure high-density polyethylene has made on housewares; the comeback made by polystyrene in this field; the introduction of polypropylene.

The polypropylene entrants (see Plastiscope, MPI, Aug. 1959, p. 35) were led by a set of shelves that weighed 4 lb., dishware, a portable carrier for phonograph records, one molder's line of mixing bowls, tumblers, and crispers. There wasn't much of it around since there isn't too much polypropylene available and experience is still limited; but there was enough to indicate that PP will soon make its mark in housewares and especially in hospital ware where it can be sterilized. Its rigidity, heat resistance, and ease of molding are properties that can't be ignored. It is still more costly than PE, supply will probably be limited until 1961, and there are the usual problems besetting a new material that may hold up its wider use in housewares for two or three years.

But high-density or linear PE is certainly moving in. Its volume is not yet anywhere near that of conventional PE, but there was definite evidence at the show to prove that many molders are beginning to change over. Within 2 years some form of higher density material, be it 100% high density, a blend, or a copolymer, will almost surely equal or exceed conventional PE in volume use at the Housewares Shows. Most proprietors who are using it had a limited number of items on display but voiced their intention of having much more in the future. One proprietor who was so busy taking orders for a beautifully designed white and gold water pitcher and tumbler set that he had little time for anything else said he was switching to high density as soon as possible for as many items as possible. He stated that its rigidity and gloss or surface finish were salable factors that are impossible to neglect if one is to stay ahead of the parade.

### Q & A

The general answers to questions concerning use of high-density PE were as follows:

*Q:* Since high density is 38¢ compared with 35¢ for conventional, how do you absorb the extra cost?

*A:* In several ways. In the first place a considerable amount of conventional PE molding material is only 32¢ so the margin is even greater, but on the other hand a good amount of suitable off-grade high density is also available at less than standard price, although we frequently use the 38¢ material if the application requires it. Then we often use a blend of both high and low density to obtain the rigidity and surface hardness desired—much of this mixed material is around 0.940 density. Also, we can use thinner walls which require less ma- **(To page 214)**

*News about* R&A SINCE 1913 **Adhesives**

**FOR ALL METALS AND ALL PLASTICS**

# Speed production bonding with this 1-part "no-mix" paste epoxy

TECHNICAL DATA ON

## Bondmaster® M620

A thixotropic, heat-curing (300°F or higher), 100%-reactive, one-part ("no-mix"), solvent-free formulated epoxy adhesive designed for bonding metals and rigid plastics as well as other rigid materials to themselves and to each other.

### APPLICATION

BONDMASTER M620 is soft and buttery, making it extremely easy to spread smoothly and evenly right from the container in which you receive it. Once applied, it maintains its form and DOES NOT FLOW during the curing cycle. Excellent for "poor fit" and similar void-filling applications as well as where dripping or running of adhesive cannot be tolerated.

### BOND CHARACTERISTICS

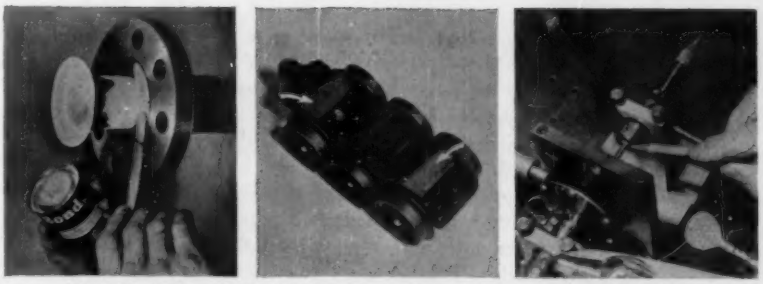
Fully-cured bonds exhibit minimal shrinkage, are electrical insulators, and provide excellent resistance to weather, galvanic action, and most chemicals, acids, and alkalies.

### ALL METALS—ALMOST ALL PLASTICS

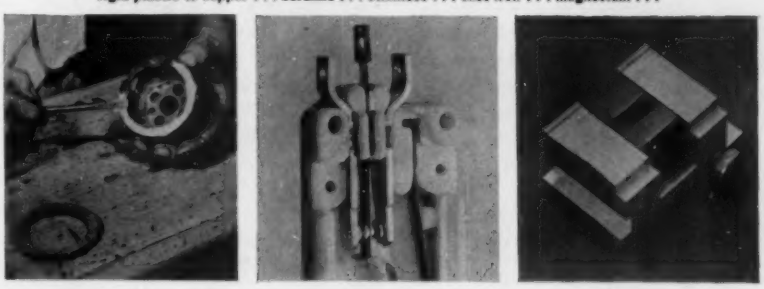
Current production usage of this formulation includes bonding: "Teflon" to steel, aluminum and other metals; phenolic to aluminum; diamonds to graphite; ceramic to steel; glass to brass; Alnico to aluminum and cast iron; carbide to steel; "Mycalex" to itself; aluminum to itself, to copper, steel, zinc die cast, magnesium, etc.; reinforced polyester fiberglas to itself and to various metals; stainless steel to bronze; rigid plastics to themselves and to various metals.

R&A SINCE 1913

**RUBBER & ASBESTOS**
**CORPORATION**
**243 BELLEVILLE AVENUE**
**BLOOMFIELD, NEW JERSEY**



"Teflon" to steel . . . Alnico to zinc die cast . . . glass to brass . . . carbide to stainless . . . rigid plastic to copper . . . ceramic . . . stainless . . . cast iron . . . magnesium . . .



If the materials you work with can be heat-cured in the 300°F range (or higher), here's an unusual development in 100%-solids epoxy adhesives—BONDMASTER M620—a unique *1-part* paste that can:

- give you high shear strength bonds between all metals and just about any plastics
- eliminate costly post-finishing (this paste won't flow or drip during cure!)
- permit the use of relatively unskilled labor on critical metal and plastics bonding jobs
- eliminate time-consuming weighing and mixing of separate components

—at a fraction of the cost-per-pound normally applying to 100%-reactive, heat-curing formulated epoxy adhesives.

### NO MIXING

You can use this versatile formulation right from the can, just as you receive it. It not only spreads as easily as a heavy cold cream, but it's thixotropic, too . . . won't flow or drip during the cure, won't sag in *any* position.

### MULTI-PURPOSE USE

Because BONDMASTER M620 offers outstanding speed and savings in the mass production bonding of a wide range of similar and dissimilar materials (see list in column on left), it is supplanting silver solder in some of the leading metalworking plants in America.

Write for Technical Data Sheet. (We will be glad to send a free evaluation sample as well if you will describe your bonding problem in detail.)

(From page 212)

terial. Sometimes we simply charge a premium price and get it.

*Q:* What do you do about the problem of stress cracking?

*A:* We once had trouble but have learned how to overcome it. We redesign the molds, change the gates, experiment with material until we find the right combination—sometimes we even heat treat the finished product.

*Q:* Can you use the same molds formerly used for polyethylene and polystyrene?

*A:* Sometimes, but they generally require alterations. Mostly we prefer new molds that not only give us a more marketable, changed design but can be built to take advantage of thinner walls, different flow properties and built-in features that help to avoid possible stress cracking.

An interesting feature of the educational program going on to saturate buyers and users with a knowledge of high-density PE is initiation of the Grace Hallmark plan which permits a molder to use the Grace trademark which guarantees that his product is 100% high density material without use of blends or off-grade material. It is an attempt to teach customers that quality in plastics is worth buying just as it is in textiles, food, lumber, or any other similar commodity.

### Unusual items

Some of the items exhibited in high density were multiple, peck size kitchen vegetable bins that can be stacked one on another with the bottom of each bin sloped so that the vegetables roll toward the front and are made easily accessible. Another bin was made of conventional PE, with high-density legs for greater rigidity. Step-on trash cans, wastebaskets, buckets, wash basins, dish pans, were much in evidence. A service wastebasket 13½ in. in diameter and 15⅛ in. tall, that holds 28 qt., costs $3.98 against $6 or $7 for metal, can be steam cleaned, and is unharmed by disinfectants, was another star attraction. Rigid mixing bowls that will withstand the beating of an automatic mixer were probably the most common item, but pitcher and tumbler sets were displayed in a wide variety. An outstanding product was a fertilizer spreader that does not corrode and sells for $7 in contrast to metal ones at $12 (See "For better garden tools—high-density polyethylene," MPl, June 1959, p. 94). Another growing use is molded lids for garbage cans, wastebaskets, pails, and containers of all sorts where the rigidity of high density is particularly applicable.

### Competition for high-density polyethylene

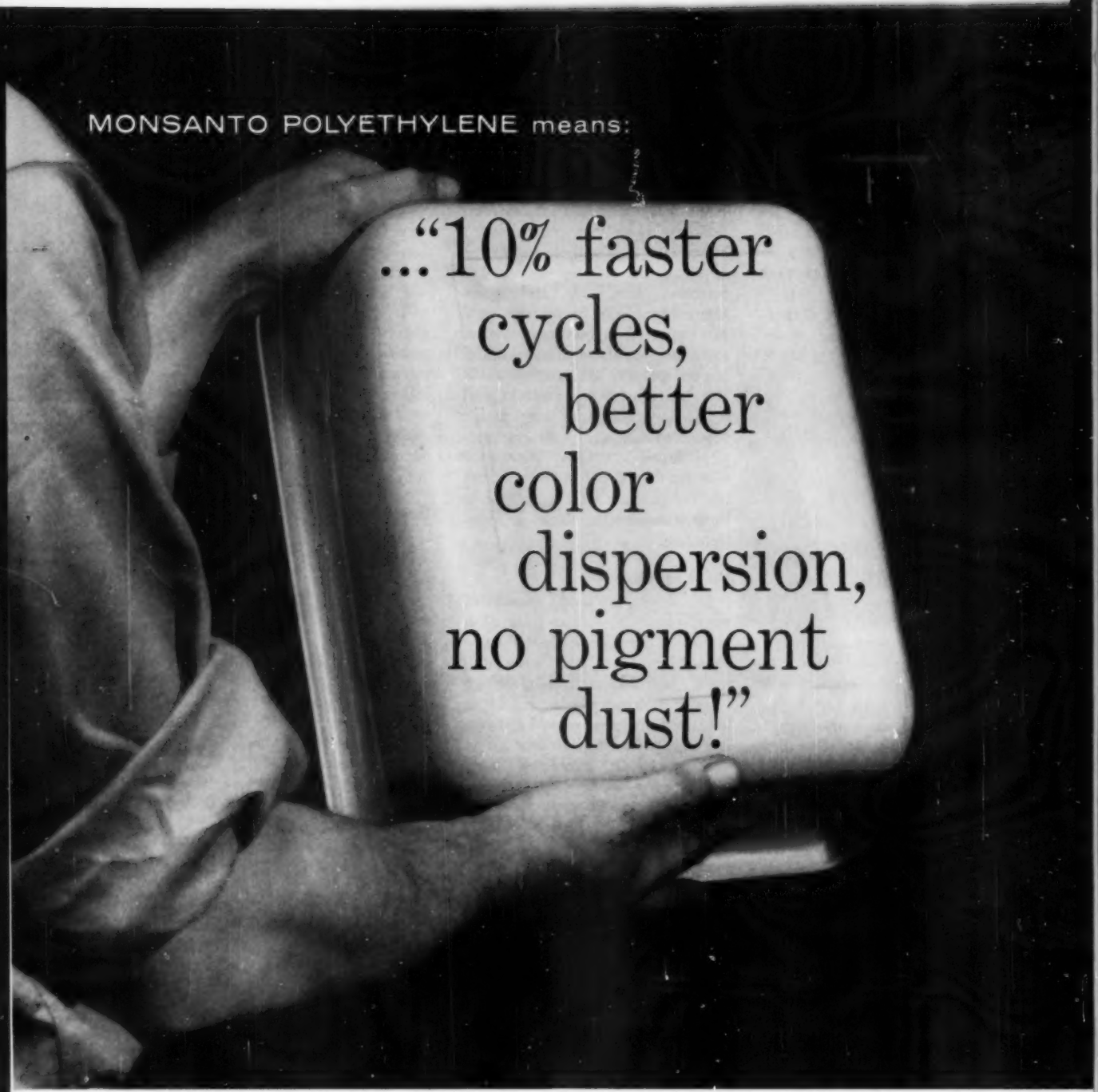
However, competitors are now on the horizon that threaten to move into the very field now sought by high density resin. Polypropylene is one. The other is Bakelite polyethylene copolymer, which despite its newness, was quite in evidence at the show. With a density of 0.935 and a low melt index, it is claimed to flow easily, to have extra good low temperature resistance, a hard, glossy surface and a 35¢/lb. price that makes it particularly useful for large moldings such as garbage cans, wastebaskets, etc. Several were on exhibit at the show and a giant size watering can was unusually impressive.

But even though high density PE gave substantial evidence that it had invaded the housewares industry many of the older and larger molders have not yet shown signs of changing over except in isolated instances. Some of them claim it has not yet proved itself a satisfactory material. Others assert that they can obtain the desired rigidity by designing the mold properly—a nifty sprinkling can was offered as proof. Some of the molders also have large volume contracts for material with resin suppliers which they want to use up before changing over. And those who can use off-grade conventional material are not likely to be interested in higher-cost high-density resin.

In any case conventional PE leads all other plastics by a wide margin in volume use at the show. It was found in all conceivable items from tiny life-like artificial lilies-of-the-valley to 55-gal. containers, from clotheslines to glazing for storm windows. Incidentally, the bells on the lilies-of-the-valley were molded and attached to artificial stems in Portugal. Other polyethylene flowers and foliage were prominent at the show, with one dealer offering kits of flowers and stems for the purchaser to arrange herself. A rose grower from Texas told how his roses could be shipped all over the country in polyethylene laminated paper and foil wrappers. But mostly the PE applications were similar to those of other years, except for new designs. There were large bathroom and diaper hampers, huge laundry baskets, 2-qt. large mouthed jars, bread baskets, egg trays, and scores of items that are handy around a house, and especially in a refrigerator.

### Polystyrene comeback

An important feature of the show was the resurgence of polystyrene, both general-purpose and high-impact. Nearly all plastics booths contained styrene items and some concentrated on them. Among them was the decorated polystyrene tumbler—now in transparent color. Rumor had it that the first machine put to work on this job two years ago never stopped. Housings of all types were predominant including one for an electric can opener. An unusual housing specialty was that of a thermometer manufacturer who uses both general purpose and high impact styrene for nearly every one of his wide variety of thermometer cases except those for high heat uses. A new item was a magnetized thermometer case that can be quickly applied to a metal surface such as an automobile body. One exhibitor showed a set of high impact styrene colored tumblers selling at 5 to 19¢ each alongside PE tumblers selling at from 8 to 19¢ each. A magnificent display of newly designed and decorated canisters indicated that polystyrene is favored in this item. In **(To page 216)**




Plastic Engineering Inc., Cleveland, Ohio, reporting:

"The bag-to-bag, blend-to-blend uniformity of Monsanto Polyethylene 9752 enabled us to slice 2 seconds per part off our cycle time. With dish-pan production in the thousands, this reduction is appreciable.

"In addition, we can now maintain uniform color throughout an entire run—a definite sales-plus. Before switching to Monsanto Polyethylene, pigmented material dust, during dry coloring, was a serious problem. During press runs, dust would escape and literally cover everything in the area. To keep foreign elements from getting in a batch and streaking the products, we had to wash down the presses between runs. It even became a morale problem, which our change to Monsanto Polyethylene has happily solved.

"One last, but not least, factor is the convenience of disposable palletized shipments. It has reduced unloading and stacking time from 3 men in 2 hours to one man in a lift truck for a half hour."

The complete line of Monsanto Polyethylene Molding Resins is described in detail in our new composite data sheet. To find out how "Big Batch Uniformity" can make your job easier and better, write for this folder, to Monsanto Chemical Company, Plastics Division, Room 960, Springfield 2, Mass.

Monsanto

# THE PLASTISCOPE

*(From page 214)*

many cases there were combinations of PE and polystyrene with the styrene serving as a lid in some cases and a base with a PE lid in others. Styrene inserts in PE pitcher handles were another featured item.

One booth showed a set of general purpose polystyrene dishware with a whorl design to minimize scratches. The proprietor stated it could be cleaned in a dishwasher without harm. A 20-piece set sells for $8.50, or without salad plates for $6.95. Styrene pitcher and tumbler sets were just as numerous or even more so than those in PE and the noted double wall insulated type showed up in a new line of unusual colors. Sugar and creamer sets in high impact formed a particularly handsome display. Vacuum formed decorated polystyrene picnic plates were the center of considerable activity and molded spoons, knives, and forks were being ordered at prices that went as low as $2.00 a thousand in quantity lots.

It could be that the January price drop in polystyrene had something to do with the resurgence of the resins in housewares which in turn may help to account for the tremendous increase in polystyrene that has been noted since early 1958.

There was also a good showing of styrene-acrylonitrile copolymer applications, mostly in bowls, pitchers, tumblers, and such. Dinnerware sets in this material are expected to become practical soon. Styrene type dinnerware is not competitive with melamine. It is a much lower cost material and fits in somewhere between picnic ware and melamine for customers who desire low cost dinnerware that isn't expected to have a long life but still isn't the type that is thrown away after a one- or two-time use.

### Vinyl on view

There was the usual amount of vinyl chloride always seen at a Housewares Show, such as shower curtains, table cloths and table mats, but no particular change from previous years in these items, except in increased growth. A fairly new shower curtain is one of taffeta protected from moisture by a 5-mil vinyl liner. High style taffeta curtains have moved into the shower curtain business but many of them sell for $17 in contrast to the more common vinyl curtains at from $2 to $7 or $8. Most vinyl curtains are from 6 to 8 mils, with thinner gage items in the $3 to $4 range. Among many other vinyl items were film covered picnic and diaper bags, plastisol coated wire dish racks, a vinyl film laminated to wood toilet seat, and vinyl foam ice buckets.

An especially good looking vinyl film shelf covering as well as a large variety of vinyl coated papers with or without an adhesive backing for decorative purposes and wall covering. An especially interesting angle was a steel corporation's display of metal garbage cans which had a vinyl decorative laminate on the outside to add glamour.

### What it teaches

Housewives have been literally smothered with plastics housewares in a few years' time. One must wonder how she can find room for more. The ingenuity of proprietors in providing new designs and new ideas for the same old thing in a new dress is indeed remarkable. From sparkling methacrylate or colorful braided polyethylene rope towel rings to highly decorated trash cans and dish pans the proprietor entices her to throw away the old and buy new. He must become a merchandising and inventive genius if he would remain in business.

---

### Coated abrasive

A flexible sandpaper to which sanded-off particles will not stick or from which they can be unloaded by simply slapping the paper, is now available from Armour Alliance Industries, Alliance, Ohio. It is claimed to be particularly useful for reinforced plastics boats and car bodies, and injection or compression molded hard-surface plastics. It is called No-Load coated abrasive, which means that it doesn't get loaded down with particles from the article being sanded. A bonded film of zinc stearate—which will not rub off during sanding—is the agent that prevents accumulation of sanded particles. The backing is beater treated paper with a rubber latex binder. The product is available in silicon carbide, aluminum oxide or garnet grits and is covered under U. S. Patent number 2,893,854.

No-Load paper lasts longer, cuts faster, and is more economical to use than other waterproof coated abrasive products, according to Armour's claims.

### PE compounds resistant to dust

Two new polyethylene compounds, which are claimed to eliminate dust attraction of injection molded articles, have been developed by Union Carbide Plastics Co.

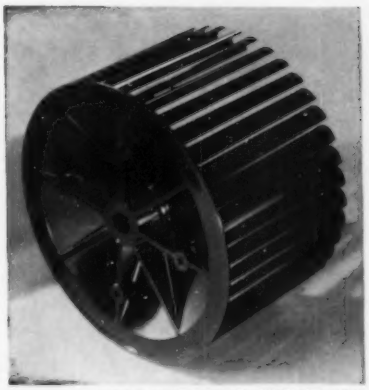
The new materials are designated Bakelite polyethylene DNDA-0401 and DPD-7366. They are said to have all the other desirable properties of high-quality polyethylene housewares compounds. DPD-7366 is based on the new PE copolymer recently introduced by Union Carbide Plastics Co. to the molded-housewares industry. As such, it reportedly has good low-temperature toughness and improved rigidity in addition to its "anti-dust" properties. DNDA-0401 is a high-flow general-purpose anti-dust housewares material which has however less rigidity than DPD-7366.

### Meeting on Food Additives

The Technical Association of the Pulp and Paper Industry (TAPPI) will devote a panel discussion of its September 21-23 meeting in Chicago, Ill., to the Food Additives Amendment to the Food, Drug, and Cosmetic Act. Speakers **(To page 218)**

# PRODUCT-DESIGN BRIEFS FROM DUREZ

- **a phenolic that simplifies**
- **plastic that foils vandals**
- **resins that bind**



DENSO ENGINEERING & SALES CO., INC.

## Breezy brainwork

**Q.** What's missing from this blower wheel?

**A.** The ring that you'd expect to see steadying the blades at the far end.

Who forgot it? Nobody. In this wheel it's superfluous. Without the ring, air enters the wheel more freely. There's more working blade area. Air flow can be modified at the factory, without retooling, simply by shortening the blades.

You can't make a wheel like this out of metal—not at a marketable price, anyway. But a general-purpose Durez phenolic works fine.

Concentricity is molded in. Wobble is much less than could be achieved economically in a metal wheel. The wafer-edged blades are rigid enough to do without tip support. They can't be bent in shipment or in assembling the blower into any appliance of which it is a part. The wheel withstands moisture and mild corrosive atmospheres; retains its shape through the range of temperatures at which it will operate.

You don't make blower wheels? All right. We're happy if we have implanted an idea for *anything* you might construct better or more cheaply with a Durez general-purpose phenolic. For still more ideas on where and how to apply these durable, versatile materials, send in the coupon requesting Bulletin D400.

## Vandalproof

Big-city switchblade artists used to rip the stuffings out of upholstered bus seats—to the tune of $100,000 a year in damage.

Then city transit authorities ordered 330 new buses with glass-reinforced plastic seats like the ones you see here. Made with tough, fire-retardant Hetron® polyester, these seats can't be slashed, defy destruction.

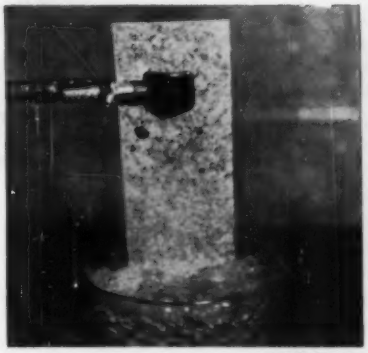
They cost less to make than upholstered seats. And the passengers like them better—voted overwhelmingly in favor of them in rider reaction tests.

Now transit officials plan to replace *all* the city's buses with vehicles featuring these vandalproof seats.

AMERICAN SEATING COMPANY

Where can *you* see a market for strong reinforced-plastic shapes that retard fire? There's a whole family of Hetron resins to help you do your visualizing. Hetron is *inherently* self-extinguishing—gives fire retardance with no loss of mechanical strength. Heat resistance, moisture resistance, electrical properties of Hetron laminates and premix-molded shapes are outstanding.

To get a better idea of what you can do with these fire-retardant resins, use the coupon to request the complete Hetron data file.



KENTILE, INC.

## A pinch of permanence

No, cooking does not improve the flavor of this cork tile.

We're just demonstrating the good strong bond that's possible, in a material such as cork, with Durez phenolic resins. Not even boiling water can weaken it.

Locking cork granules together is one of hundreds of bonding jobs these resins can do. You might want to delve into their equally salutory effects on rubber, paper, sand, asbestos, or ground wood.

Under heat, the resin softens, then sets hard, presenting thereafter a permanently stubborn front to heat, moisture, and abrasion. You can get resins that impart many different combinations of useful properties. It doesn't take much resin—often only one part in ten—to get the results you're looking for. And phenolic is one of the lowest-priced bonding agents you can buy.

If you want to know how you might add a pinch of permanence to a product, mail us the coupon. The bulletin you'll receive tells how 12 industries are doing this very thing with Durez resins.

**For more information** on the Durez materials mentioned above, check here:

- ☐ 8-page Bulletin D400 lists properties, uses, design advantages of general-purpose Durez phenolics and other thermosetting materials.
- ☐ Data file (50A) on Hetron fire-retardant polyester resins.
- ☐ Industrial applications of Durez phenolic resins (12-page bulletin).

**Clip and mail** to us with your name, title, company address. *(When requesting samples, please use business letterhead.)*

**DUREZ** PLASTICS DIVISION

12009 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

# THE PLASTISCOPE

(From page 216)

will discuss the points of view of the government, paper industry, plastics industry, converters, and users. E. Balestier of Visking Corp. will speak in behalf of the plastics industry.

Other panels will discuss permeation, plastics coatings and laminates, and other subjects that are pertinent to plastics as well as paper combinations.

### Special effects for PP and PE

A pearl polypropylene material, and a low-cost polyethylene blend especially created for blow molding of doll bodies and limbs, have been developed by Plastic Materials & Polymers, Inc., Hicksville, N. Y.

The pearl PP in standard concentration costs 63¢/lb. in carload quantities. It is expected to find wide use for closures, containers, brushes, bags, buttons, and jewelry.

A dull finish PE blend, that simulates a baby's skin, is expected to find wide use in blow molded dolls. It can be compounded to meet different specifications in soft or semi-rigid PE, combined with color and various additives. This material costs 40¢/lb. in carload quantities.

### Odorless plasticizers

Further improvement in the low-odor characteristics of two plasticizers widely used in plastic food packaging has been announced by Monsanto Chemical Co. Diethyl phthalate and Santicizer B-16 now are available from the company as practically odorless compounds.

Santicizer B-16 is used to obtain good heat and light stability, oil resistance and several other properties in polyvinyl chloride, polyvinyl acetate, and nitrocellulose films. It is suggested for use in formulations for beverage tubing, food wrappings, adhesives, and cap sealers and liners.

Diethyl phthalate is used for high compatibility, light stability, and good molding characteristics in cellulose acetate formulations for sheeting and molding. It reportedly imparts quick tack, good adhesion, and good flexibility, as well as water resistance to polyvinyl acetate adhesives.

### Courses on plastics

Evening courses on process properties of plastics, extrusion of plastics, and plastic product design are offered during the fall term by Newark College of Engineering, 323 High St., Newark 2, N. J. Classes take place three times a week, beginning September 16, 1959.

### Bristol-Myers sells Kimball

The assets and business of Kimball Mfg. Corp., San Rafael, Calif., custom molder and producer of fibrous glass products, has been sold by Bristol-Myers Co. to a new corporation formed by William R. Kimball.

In contrast to other companies in the drug business who have diversified in recent years by acquiring plastics companies, Bristol-Myers will concentrate its activities in ethical and proprietary drugs and allied specialties. Kimball, acquired in 1955, was the last subsidiary not in the company's basic lines of activity. Bristol-Myers previously disposed of Rubberset Co. to Sherwin-Williams Co., and Sun Tube Corp. to American Can Co.

Mr. Kimball will serve as president of the new Kimball corporation, which will continue to offer the same services and products. George R. Mallory serves as vice-president of the corporation.

### Polyester film laminates

A new laminated polyester film said to have excellent flexibility and mechanical strength, good electric properties, high heat resistance and excellent resistance to lamination has been developed by Mica Insulator Div. of Minnesota Mining & Manufacturing Co., Schenectady, N. Y.

Designated Lamicoid LPF-1, it consists of two plys of 0.010-in. polyester film, which are laminated together using a special bonding agent. The resultant material can be easily cold formed with simple wooden molds or punched into a variety of shapes and forms. Because of its flexibility, it can be repeatedly creased over itself or bent into small radii without cracking, breaking or delaminating, it is stated.

The sheet is presently being used as a U-shaped slot liner in hermetic motors, where resistance to Freon 22 and severe mechanical abuse during assembly are required. It is particularly adapted to applications requiring the formation of simple shapes that are tough and flexible, as well as form retentive.

**For flexible printed circuits,** the company has introduced a copper-clad laminate which is said to make possible substantial savings in space and weight in electronic equipment. Called CuFlex Lamicoid sheet, the new laminate consists of 1-oz. electrodeposited copper foil bonded to either 0.002- or 0.005-in. flexible polyester film. The laminates can be twisted or bent to fit the requirements of many wiring layouts, it is claimed.

The continuous length of the laminates makes them suitable for automatic production precedures, since long rolls can be suspended, strips rolled off and then cut into the desired lengths.

CuFlex Lamicoid sheet can be supplied in full width 36-in. sheet or slit into tape as narrow as ¼-inch.

### Sulfonate for vinyl foam

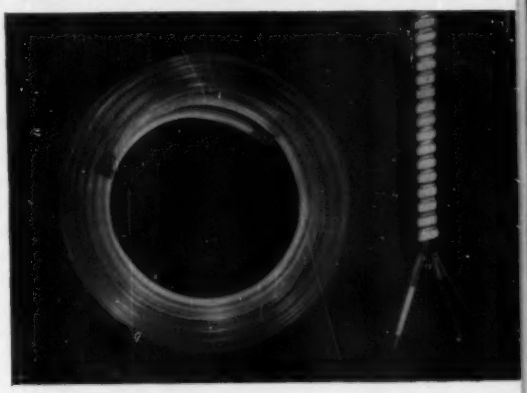
A synthetic calcium sulfonate in a plasticized system, manufactured by Continental Oil Co., is said to produce finer, more uniform cells in open-cell vinyl foam in which blowing is completed before gelation. The new product, called Conoco Demivis, reportedly exhibits good compatibility with PVC resins, and its light color results in whiter foams.

### Aids urethane molding

A new fluid mold release agent to free urethane foam from reinforced plastics molds has been developed by Shanco Plastics & Chemicals, Inc., Tonawanda, N. Y. Designated Shanco 32-6, the new material is said to be solid at foaming tem- **(To page 220)**

# OPALON*

for every possible type of vinyl application



A wide range of OPALON VINYL resins and compounds have been perfected by Monsanto to meet the specific needs of molders of appliance parts, housings, toys, phonograph records, rain-wear . . . extruders of wire and cable insulation, garden hose . . . calenderers and extruders of vinyl film and sheeting . . . manufacturers of floor tile . . . coaters of textile and paper for upholstery and wall coverings . . . and compounders of plastisols for metal coating, slush-molding, foaming, and dipping. Specify OPALON vinyl—and profit from Monsanto research, experience, and productive capacity. Monsanto Chemical Company, Plastics Division, Springfield 2, Massachusetts.

Monsanto

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# THE PLASTISCOPE

(From page 218)

perature and readily removable at a slightly higher temperature.

The release agent is painted on, the mold is then placed in an oven at about 130° C. for 10 min., after which the coating is allowed to cool and harden.

### For vacuum metallizing

A new line of lacquers for application before and after the deposition of aluminum in the vacuum metallizing of polystyrene has been developed by Schwartz Chemical Co., Inc., Long Island City, N. Y.

The lacquers, designated as TC-101 top coat and BC-107 base coat, complement each other. Both coatings are easily applied by spraying, dipping or flow-coating, and are air dried for 10 to 20 min. prior to force oven drying.

Both lacquers cost $3.10/gal. in 5-gal. quantities, and $2.95/gal. in 55-gal. quantities, clear, and 15¢/gal. more in colors.

### Ford now makes vinyl-metal laminates

United States Rubber Co. has licensed Ford Motor Co. to use the Marvibond method for continuously laminating vinyl to metal. Ford thus becomes the first automotive licensee of this technique. Vinyl-coated steel is used in the 1959 Thunderbird interior and other uses are under study by Ford. It is expected that this technique will eventually be used on exterior styling as well.

Ford, the nation's 13th largest steel manufacturer, will produce steel for the laminate at its Rouge plant in Dearborn, Mich. Vinyl film for laminate use will be made in the Ford Motor chemical products plant in Mt. Clemens, Mich. This plant was activated by Ford in the summer of 1958 to produce vinyl automotive trim.

### Sells urethane foam resins

A series of urethane foam prepolymers are now available in simple-to-formulate kits from Hastings Plastics, Inc., Santa Monica, Calif. Designated Hathane foam, the material can be supplied to produce foam in 2-, 4-, 6-, and 8-lb./cu. ft. densities. Each density is obtainable in rigid, semi-rigid, and resilient formulations. The rigid foams are produced by the conventional urethane reaction; the other two use fluorinated hydrocarbons as blowing agents.

According to the company, these polyester based foams obtain their optimum properties within 24 hr. when they are kept at room temperature.

### New industry association

An Insulation Information Center, for consultation by industry on insulation characteristics, application techniques, and specifications has been established by the newly formed National Insulation Manufacturers Assn., 441 Lexington Ave., New York 17, N. Y.

The service will be headed by John M. Barnhart, association executive secretary, and Raymond C. Parlett, who has just been appointed technical adviser and chairman of the association's technical and research committee.

At the present time companies represented by NIMA make insulations for the full temperature range of −460 to 1900° F.

### PE furniture in the home

The success of injection molded polyethylene school furniture (See "Want better school seats? Try polyethylene," MPl, May 1959, p. 90) has given impetus to plans for providing PE furniture for the home.

Contoured chairs of crinkled white molded linear PE for seat and back, mounted on a metal tubular frame, produced by the Panelyte Div., St. Regis Paper Co., were recently exhibited in Chicago, Ill. These chairs were field tested by American Seating Co., with whom Panelyte conducted a research program.

Panelyte is currently cooperating with several manufacturers in a new design program utilizing the polyethylene molding technique for kitchen, dinette, lawn, and porch furniture. These design projects could include combinations of PE molded seats, arms and backs, integrated with other plastics or with metal materials. All indications are that molded PE chairs will be on the consumer market in 1960.

### Plastics plumbing system

An all-plastics plumbing system —including hot-water lines—and reportedly the first such system in the United States—has been installed in the Knoxville, Tenn., research house sponsored by the National Association of Home Builders Research Institute and the Masonite Corp.

The hot water lines are produced from polypropylene and are ¾-in. Schedule 80 pipe, with threaded fittings. For the cold water service from the meter to the house, Carlon's Hi-Mol PE flexible tubing is used. Cold water lines inside the house consist of ¾-in., Schedule 40, ABS pipe with solvent-welded connections; and ¾-in., Schedule 80, normal impact polyvinyl chloride pipe with some solvent-welded and some threaded connections.

For the interior sewer line and vent pipe, 2-in. high impact PVC, Schedule 40, pipe with normal impact fittings is used; exterior sewer and drain field lines use 4-in. high-impact rubber-modified polystyrene pipe, both plain and perforated.

All of the plastics pipe used in this NAHB research home was supplied by Carlon Products Corp., Cleveland, Ohio, and most of the necessary fittings were obtained from Tube Turns Plastics, Inc., Louisville, Ky.

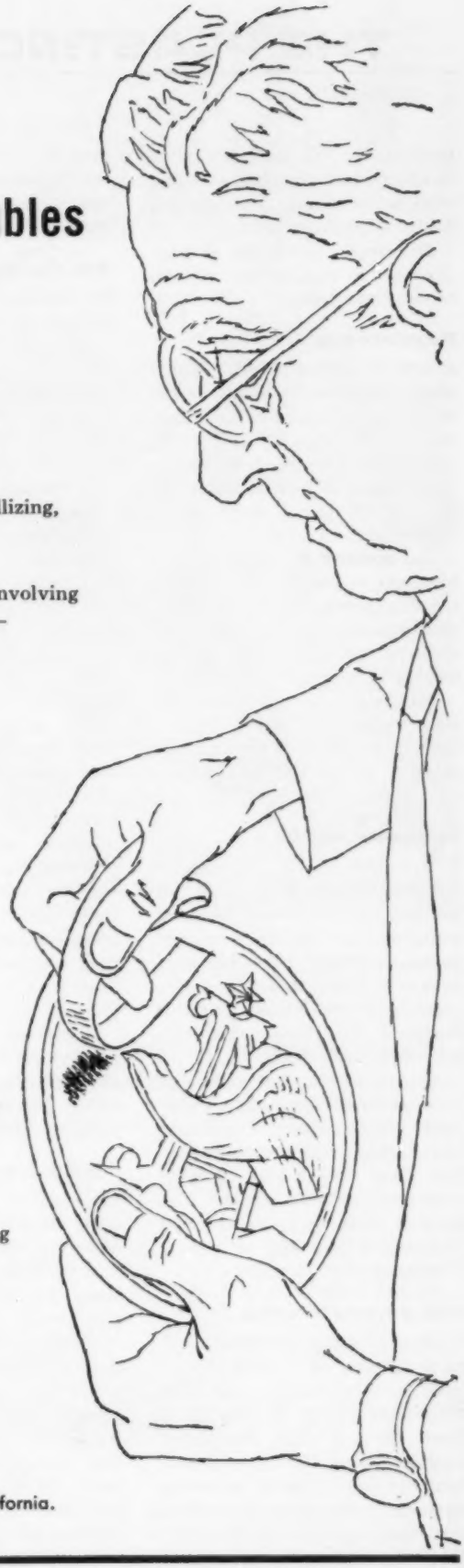
### Speeds PE packaging

A new PE film grade resin called Petrothene 207-62, which is reputed to give a balance of slip and anti-block properties, has been announced by U. S. Industrial Chemicals Co.

Slip is the ability of one film layer to slide horizontally over another, while blocking is the condition whereby film sticks to itself and is difficult to pull apart vertically. Both factors influence the speed of packaging, the company emphasizes. Too little slip makes the film hard to handle when inserting **(To page 222)**

Despite the best of care...

# Who hasn't had some troubles with vacuum metallizing?



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# THE PLASTISCOPE

(From page 220)

products in PE bags, while too much can cause finished packages to slide excessively, creating difficulty in stacking.

The new resin is said to produce a film that minimizes both of these problems.

### Polyolefin wax

A new, petroleum jelly-like polyolefin wax has been announced by Philip H. Rhodes & Associates, 2861 Sidney Ave., Cincinnati 25, Ohio. It is a gray semi-fluid paste which starts to melt at about 80° F. and is completely liquid slightly above 212° F.

The product is proposed as a lubricant in mechanical processing of plastics and rubber, as a mold release agent, etc. It is not approved for use in food processing, the company states.

The wax has a molecular weight range of 3500 to 4000; its density is about 0.87; and the viscosity at 125° C. is approximately 600 centipoises.

### Polypropylene yarn

Flat weaves of a light-stable polypropylene yarn are about to be marketed by several webbing manufacturers for deck chairs, garden furniture, and other outdoor uses. Designated Reevon, the yarn is a special development produced by Reeves Brothers, Inc., New York, N. Y.

According to the company, these yarns are ultra-violet stabilized, nonabsorbent, chemically inert, mildew resistant, and odorless. They have a high abrasion resistance and good tenacity. The price of these weaves is expected to compare favorably with those of other synthetic weaves.

### Film prevents infection

A surgical spray dressing based on a solution of a methacrylate resin in ethyl acetate has been introduced by E. R. Squibb & Sons, Div. of Olin Mathieson Chemical Corp. Designated Rezifilm, the new dressing forms an adherent transparent protective film when sprayed on the skin. Surgical incisions may be made directly through the strong, flexible, transparent film. The product is supplied in 2-oz. aerosol dispenser cans at $1.75 each.

### Wire insulation plasticizers

Performance equivalence to the premium-priced plasticizers in the 90 and 105° C. vinyl wire insulation field is claimed for the lower cost ditridecyl phthalate (DTDP) by Enjay Co., Inc. The company points out that esters as high in molecular weight as DTDP were thought incompatible with vinyl resins; but only under extreme temperature and humidity conditions was any evidence of incompatibility noted in Enjay's tests. DTDP-plasticized samples that were stored for two years at room temperature also showed no evidence of incompatibility, Enjay points out.

The company also states that didecyl phthalate (DDP) is a very good low-cost plasticizer for 80 to 90° C. wire insulation. These esters, based on Enjay oxo alcohols, are said to give wire and cable extruders two very desirable low-cost raw materials. Mixtures of DTDP and DDP, or the co-ester, decyl tridecyl phthalate, lend additional flexibility to the formulator, both in performance and cost.

According to Enjay, approximately 100 million lb. of PVC were used in wire coating in 1958, which represents a market for some 50 million lb. of plasticizer.

### Films in construction

Growing use is being made of triple laminated films as moisture vapor barrier materials in buildings, according to Acme Backing Corp., Stamford, Conn. The company supplies a barrier material of 0.0001-in. aluminum foil sandwiched between two layers of 0.0005 Mylar A, and also a triple laminate with 0.00088-in. cellulose acetate instead of the polyester film. The Mylar laminate is suggested for any applications in the construction field, because it has a high order of abrasive resistance and excellent flexing. Where a minimum of flexing after installation, and abrasion resistance of a lower order is sufficient, the company suggests the cellulose acetate material. Both types are sold under the Acmeflex tradename.

### Extrudes butyrate sheets

Transparent and colored sheets of butyrate are now being extruded by Cadillac Plastic & Chemical Co., Detroit, Mich. Made from Tenite material, these sheets will be stocked in sizes from 48 by 50 in. to 50 by 96 in., in 40-, 60-, 80-, 100-, and 125-mil thicknesses. Widths from 24 to 50 in., and lengths as desired, will be extruded to order.

Cadillac has arranged with other distributors to handle the sheets in areas outside its own network of 11 sales offices and warehouse facilities.

### Aids film users

A set of comparisons between the properties of its nylon film and other commercially available materials for transparent packaging has been compiled in a spec sheet by M & Q Plastic Products, Freehold, N. J.

The sheet offers engineers and purchasing agents a comprehensive picture for making selections on the basis of general properties, mechanical properties, thermal properties, and permeability of films to water vapor, gas, and odor. The comparisons are made between medium and higher density PE film, polypropylene, and M & Q's nylon film.

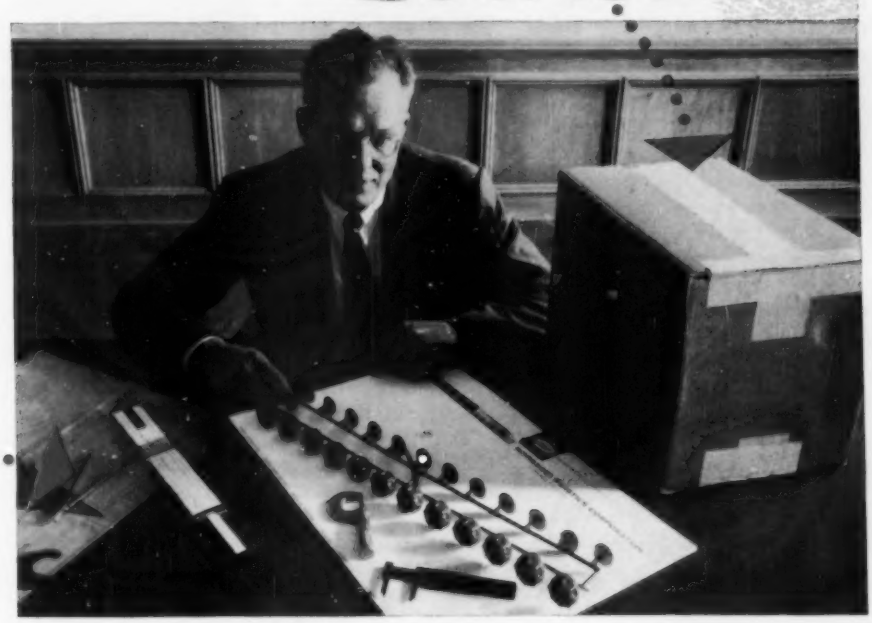
### Plastics in buildings

A study to establish the basic considerations affecting the use of plastics in buildings as related to fire safety has been undertaken at the Southwest Research Institute, San Antonio, Texas, by the Manufacturing Chemists' Association, Inc. (MCA).

The one-year project will seek to establish the position of plastics as used in buildings relative to traditional materials, from the viewpoint of fire safety as related to building-code regulation.

MCA's Plastics Committee views the project as one which will provide a realistic and objective point from which may evolve a broader use of plastics ma- **(To page 224)**

# "Start to Finish" Service



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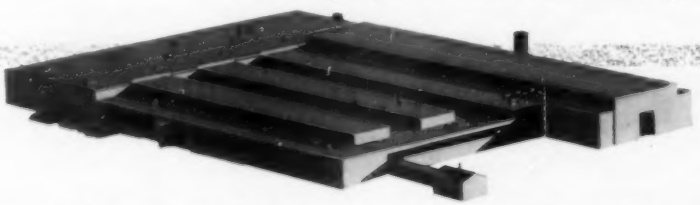

**MINNESOTA PLASTICS CORPORATION**

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# THE PLASTISCOPE

(From page 222)

terials consistent with prime requirements for public safety. Cost of this initial study is approximately $19,000.

### Hercules' stake in missiles

The third- and fourth-stage rocket engines of the solid-propelled project Scout vehicle will have plastics cases developed by Hercules Powder Co. The plastics material is said to be as light as magnesium and as strong as steel, and is being produced by Hercules Young Development Div. The plastics cases will replace much heavier metal cases.

The Air Force recently awarded a $15,326,000 contract to Hercules for research and development of a third-stage engine for the solid-fuel Minuteman intercontinental ballistic missile.

### Pearl pigment

A new synthetic pearl pigment, that is said to have greater brilliance than natural pearl essence, has recently been introduced by The Mearl Corp., 41 East 42nd St., New York 17, N. Y.

Designated Nacromer Z, the pigment is in paste form and is available in formulations for incorporation directly into methacrylate, polyester and other thermoplastics, as well as for use as a coating on plastics, glass, etc. As a coating, the new product is available in formulations which are compatible with most of the coating vehicles.

In addition to simulating natural pearl effects, Nacromer Z can be used to obtain a wide range of lustrous effects either incorporated into the plastic or as a coating. It is now being investigated for use in cast sheeting.

### Vinyl tackboard

Over a million square feet of a new type bulletin board material is slated to be installed in California school rooms this year.

The new combination of materials, called Koroseal Vinylcork Tackboard, is fabricated in Los Angeles, Calif., by A. B. Boyd Co. Sheets of quarter-inch cork 48-in. wide in lengths up to 72 ft. are laminated with Koroseal vinyl wall covering material that is currently available in a variety of 12 decorator colors.

The Koroseal material, supplied by B. F. Goodrich Industrial Products Co., a div. of The B. F. Goodrich Co., has a deep-embossed fabric-textured surface that eliminates glare and has a prolonged new appearance because it quickly closes the holes after tacks are removed. The lamination of Koroseal on cork is a roll-on high pressure process that provides a smooth as well as permanent bond.

A. B. Boyd Co. states that the vinyl tackboard surface is nonfading and requires practically no maintenance. It can be cleaned with mild soap and water, and is priced about the same as many older types of tackboards.

The new tackboard material is not limited to public and private schools. It is being installed in libraries, hotel display rooms, industrial conference rooms, public buildings, and other places where a bulletin board surface must harmonize with the surrounding color scheme.

### Supplies nylon 11

Belding Corticelli Industries, a wholly owned chemical producing subsidiary of Belding Heminway Co., Inc., has completed an agreement with Organico S.A. of France to market the chemical Type 11 range of nylon resins in the United States. These resins, which are derived from the castor bean, have received broad acceptance in the European market for several years.

Under the agreement, BCI will initially supply the Type 11 resins from imported stock. Plans for the domestic production of these resins will follow at an early date.

The Type 11 nylon resins are said to have the same outstanding physical properties of the domestically produced nylon resins, including dimensional stability of moldings resulting from low total moisture absorption (reportedly the lowest moisture absorption of the commercially produced nylons), good electrical properties, and a broad temperature range for forming which makes possible the production of unusually large pieces, such as complete sink units, and generally contributes to easier molding.

The resins will be competitively priced, it is reported.

### Liquid cleaner for vinyl

A concentrated multiple purpose cleaner, said to be particularly suitable for vinyl, fibrous glass, and other plastics materials, is available from Shralyte Co., Cleveland, Ohio. Designated Lysyn, the product contains an odorless germicide, is non-flammable, and does not injure the material to which it is applied, according to a company spokesman.

### Promotes vinyl adhesion

High levels of adhesion can be obtained between vinyl plastisol or film, and nylon, Dacron, rayon, or glass fabric by the use of Dianisidine diisocyanate (DADI), a product of The Carwin Co., North Haven, Conn. The adhesion is independent of fabric construction, and the bond has been submitted to one million "s" flexes with no reduction in bond strength, the company reports.

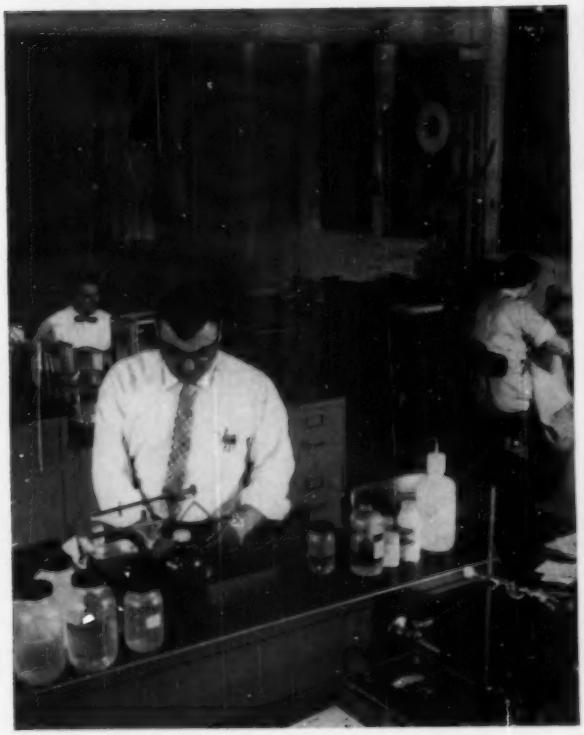
The primer coated cloth is stable for at least 60 days and is expected to be stable indefinitely. Variations in the amount of plasticizer in the primer will change the hand of the primer coated fabric with only a minor difference in the level of adhesion.

Plastisol coatings of the primer coated cloth may be obtained by any standard technique. Vinyl film may be laminated to the primer coated cloth by passing the fabric and film over preheating rolls and then between heated pressure rolls. High levels of adhesion can similarly be obtained by calendering.

### For dyeing polyester buttons

Specking and dark centers that frequently occur in the dyeing of polyester buttons are said to be eliminated when Tanavol and Tanapal B are used. These products are manufactured by Tanatex Chemical **(To page 228)**

# THEY TEAR IT PULL IT STRETCH IT BURN IT!



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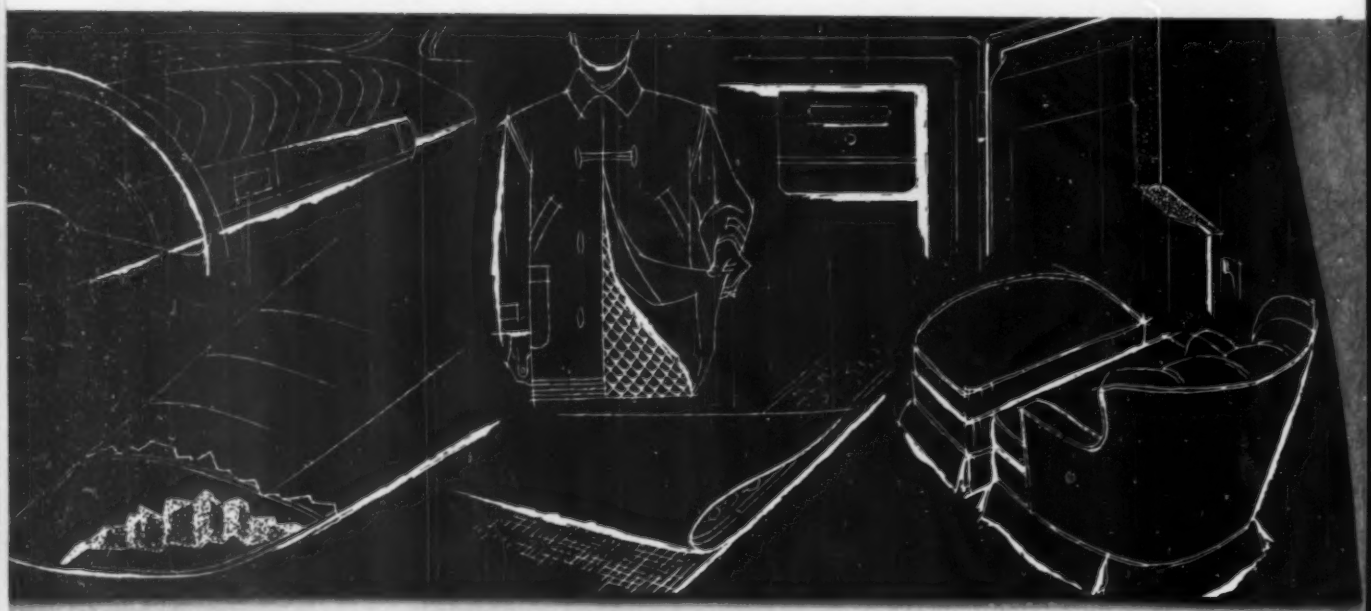

*Left to right:*

- CRASH PADDING
- AIRCRAFT CONSTRUCTION
- CLOTHING INTERLINERS
- RUG UNDERLAYS
- REFRIGERATOR INSULATION
- FURNITURE CUSHIONING
- AUTOMOBILE CUSHIONING
- PROTECTIVE PACKAGING
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# THE PLASTISCOPE

(*From page 224*)

Corp., Kearny, N. J. According to the company, the use of these chemicals produces even dyeings in light and heavy shades. Tanavol and Tanapal B are also being evaluated for use in dyeing sheets.

#### Kralastic in Italian cars

Each new Italian-made Fiat 2100 car is using 12 lb. of Kralastic. Its windshield and window trim, steering wheel housing, and entire dashboard are molded from the ABS copolymer produced by Naugatuck Chemical div., U. S. Rubber Co., and marketed by the company's international division.

The parts are all injection molded in Italy. The largest piece is the dashboard, a one-piece molding which is 4 ft. long and a foot wide. It is all black, with a dull and textured surface to help minimize glare.

According to Naugatuck, Kralastic is used for the Fiat, because it has good resistance to impact and stress; is dimensionally stable, and is light in weight. Also, its heat resistance is well above temperatures encountered in auto use, and its use eliminates considerable trim and painting.

#### Fluorescent pigments

A new line of eight Hi-Viz fluorescent pigments is available from Lawter Chemicals, Inc., 3550 Touhy Ave., Chicago 45, Ill.

Among the materials with which the new pigments can be used are polyethylene, polystyrene, and vinyl plastisols. The company has prepared a detailed technical bulletin on Hi-Viz fluorescent pigments, which includes background on fluorescents, physical properties, suggested formulations, resistance and weatherability factors, recommended vehicles, and suggested use with non-fluorescent pigments to brighten the tonal qualities of regular colors.

## Reinforced plastics

**For military uses.** A new glass fiber reinforced alkyd molding compound called Glaskyd 2051, designed primarily for electrical parts in military applications, has been introduced by Glaskyd, Inc., Perrysburg, Ohio. It is classified as an MAI-30 material, and is covered by Military Specification MIL-M-21699.

Developed specifically for applications where flame resistance, good strength, and excellent electrical properties and moldability are desired, the new compound is said to provide economies in the initial cost as well as ease of handling.

Like other Glaskyd molding compounds, 2051 is produced and packaged in continuous rope form in diameters from ½ to 1¼-inch. Where larger diameters are needed it is supplied in logs or precut pieces of the required weight. It is currently supplied in light tan color.

For many civilian applications the same formulation is available in a wide range of colors as Glaskyd 2301.

**New DAP materials.** Acme Resin Corp., Forest Park, Ill., has added two new fibrous glass reinforced diallyl phthalate compounds to its line of military approved molding materials for the electronics industry. Designated as Acme 1-530 and Acme 1-250, the two DAP compounds now carry Military Approval respectively as Type GDI-30 (MIL-M-19833 SHIPS) and Type SDG (MIL-M-1879A NAVY).

DAP materials are useful for dielectric use in switches, connectors, potentiometers, resistors, and various other electronic components because of their good electrical properties, high heat resistance and also their excellent dimensional stability.

**Stocks molded shapes.** Angle and channel shapes of reinforced plastic for use as bus supports, tie bars, and insulating structural members, are now available "off-the-shelf" from The Glastic Corp., Cleveland, Ohio. The stock, colored red, comes in 14 sizes and shapes, and is molded in lengths up to 76 in. and in widths up to 9⅜ inches. It is available as molded, or cut to specifications. The fibrous glass reinforced polyester members will meet requirements for Class B insulation, and will operate continuously at 260° F. Physical and electrical properties meet NEMA GPO-1 specifications, and the members are flame retardant.

**Rolls of panels.** Development of a new, decorative fibrous glass panel in 50-ft. rolls was announced by Filon Plastics Corp., El Segundo, Calif.

The 4-oz./sq. ft., 30-in. wide material features a black and gold jackstraw pattern embedded in frost, clear, or snow panels, suitable for shoji screens, room dividers, table tops, cabinet doors, and luminous ceilings. Suggested retail price is 49¢/sq. foot.

## New companies

**National Plastic Films, Inc.,** 1541 S. Walnut St., Ottawa, Kan., has started operations of its film extrusion plant employing the chill roll casting technique. Initial production capacity will be a million lb. of PE film per year. The company will also supply nylon and polypropylene film.

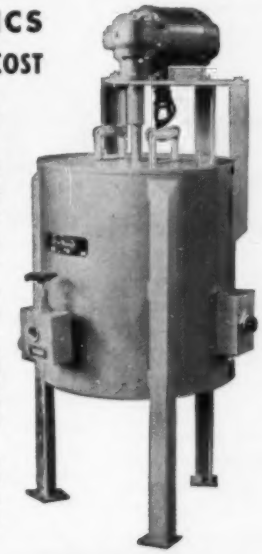
**Charles S. Imig,** previously with the research dept. of Phillips Petroleum Co., and the technical service section of Spencer Chemical Co., is president.

**Coz Chemical Corp.,** Providence Rd., Northbridge, Mass., has been formed as a service organization to carry out custom coloring and compounding of all types of thermoplastic resins, including high impact polystyrene. The company will also do consulting work on molding and material problems; distribute chemicals for the plastics industry; conduct research and development programs on new types of resins; and produce special effects and shapes in thermoplastic materials.

**Alfred L. Coz** is president, and **Henry Coz** is sales manager for the New England area.

**Australian Petrochemicals, Ltd.,** a new company formed jointly by **Monsanto Chemical Co.,** and **Petroleum & Chemicals Corp. Ltd.** started **(To page 230)**

# MELT PLASTICS AT LOW COST



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| 1 to 11 cans | $1.60 per can |
| 1 to 4 cases (12 cans each) | $16.80 per case |
| 5 to 9 " | 15.60 " " |
| 10 to 24 " | 14.40 " " |
| 25 or more cases | 13.20 " " |

20 OZ. GIANT CAN

**DON'T DELAY! ORDER TODAY!**

**BORCO CHEMICALS**

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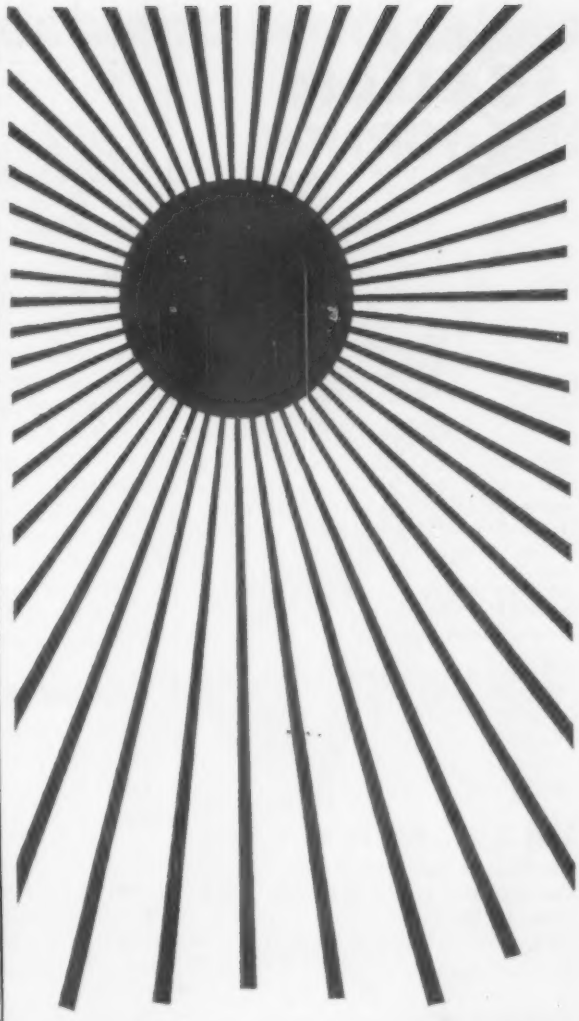

# MERCURY-CADMIUM REDS

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**SUPERIOR DISPERSION**
**EASY DRY-COLORING**

WRITE FOR SAMPLES AND BULLETIN 29, COLOR CARD

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Subsidiary of

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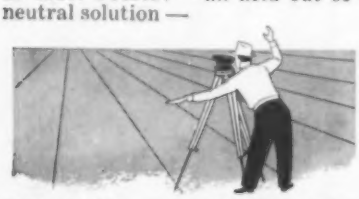
Microscopic particles of carbon black have some fascinating powers. For instance, take the selective attraction for ions . . . the proper grade of colloidal carbon in a solution of ordinary salt will exchange hydrogen for the sodium ions . . . leaving the chlorine as HCl! Presto! — an acid out of a neutral solution —



SKIN DEEP... BUT SO MUCH SKIN!

Such ion exchange takes place only on the surfaces of the particles . . . but what surfaces! There are more than 8,000,000,000 particles in each letter of this sentence! Imagine the total surface area in a handful of colloidal carbon! It's best measured in acres! Such incredible surface areas can accommodate a lot of ions.

A LION WITH IONS

This characteristic . . . controllable by Columbian production methods . . . affects such things as adsorption of metals, of salts, of organic acids. It can affect the rate of cure of rubber compounds, the drying rate of paints. It may have new uses for improving your product. Find out—how . . . now!

COLUMBIAN CARBON COMPANY

380 Madison Ave., New York 17, N. Y.

DEPT. A


## THE PLASTISCOPE

*(From page 228)*

construction of a multimillion-dollar plant near Sydney, Australia, to produce styrene monomer. Manufacturing operations are scheduled to begin in 1961.

**Packaging Consultants, Inc.**, Washington, D.C., is a new firm of packaging engineers. **Thomas P. Wharton,** former vice-president of Container Laboratories, Inc., and manager of its Washington Div., resigned from that position to become the president of the new company, which will engage in the development, evaluation, and application of new packaging materials; the promotion of advanced packaging concepts; and the integration of packaging and handling methods.

### Expansion

**Reichhold Chemicals, Inc.** intends to purchase the **Varcum Chemical Corp.** for an undisclosed amount of cash.

Varcum manufactures a wide range of liquid, powdered, and solid phenol formaldehyde resins; resins for metal can coatings, paints and varnishes; insulating varnishes for all types of wound equipment, and for other specialty applications. The company maintains offices, research facilities, and manufacturing operations in Niagara Falls, N. Y., and also has a subsidiary company in Lindsay, Ont., Canada.

This acquisition will add a new line of resins and compounds to the present group of Reichhold products. It will also provide an additional plant in Canada which will be devoted to the manufacture of molding compounds.

It is planned that Varcum will operate as a division of RCI, with **George E. Lewis** continuing as president of this division, **Dr. Roland R. McDonald** as vice president in charge of research, **Donald E. Keenan** as vice-president in charge of production, and **John C. Cummings** remaining as sales manager.

**Visking Co., Div. of Union Carbide Canada Ltd.**, will construct a modern plant of approximately 24,000 sq. ft. on a 10-acre tract in Cowansville, Quebec, Canada. The new facilities, to be completed early next year, will increase Visking's polyethylene film capacity in Canada by 50 percent.

**Du Pont** plans to build a major plant to produce polyethylene resin at its Victoria, Texas, Works. Construction is expected to be completed by early 1961. Capacity has not yet been announced.

This will become Du Pont's second PE plant. The Sabine River Works at Orange, Texas, will continue as the company's major facility for polyethylene. A major expansion program which almost doubled the capacity of the Sabine River Works for manufacturing Alathon PE resin was completed last year.

Since its completion in 1951, the Victoria plant has produced adiponitrile, an intermediate used in the manufacture of nylon textile yarn and nylon plastics.

**Pacific Carbide & Alloys Co.** has completed final engineering studies for a new $500,000 chemical plant at Portland, Ore., to produce vinyl acetate monomer.

**Tom Waters,** Portland manager for Pacific Carbide, said provision is being made for expansion to 10 million lb. a year production as the market grows.

**Colton Chemical Co.,** a division of **Air Reduction Co., Inc.,** is adding a multimillion pound ester plant, warehouse, and bulk storage tanks to its Elkton, Md., facilities.

Scheduled for completion in late 1959, the cost of the project will be close to $300,000. This expansion follows increases in emulsion production facilities at Elkton an Cleveland, Ohio, completed during the past year.

The new ester plant will manufacture dibutyl maleate, dibutyl phthalate, and similar products used in emulsion systems. Polyvinyl acetate and copolymer resin emulsions, are the principal products of Colton Chemical Co. Other products manufactured at plants in Elkton and Cleveland are polyvinyl alcohol, polyvinyl acetate beads, spray-dried PVAc, and urea formaldehyde foamed resins used for evapora- **(To page 232)**

# Injection molding machines for plastics

***Locking force:***

# 2500 T.

**WITH PREPLASTICIZING**

**Mod. 2200/P. 160**

***HYDROMECHANIC CLAMPING***

**Injection capacity** up to **700** ozs.

**Plasticizing capacity per hour**
**485** to **880** lbs.

| CHARACTERISTICS | |
|---|---|
| Locking force Ton. | Short ton T. 2500 |
| Max. daylight between open platens | mm. 2500 |
| Mobile platen's stroke | mm. 1500 |
| Mould thickness max. | mm. 1500 |
| Mould thickness min. | mm. 1000 |
| Platens size between tie-bars (Horiz.) | mm. 1950 |
| (Vertical) | mm. 1300 |

## LARGE PLATENS
## BIG ROOM



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Telegrams: TRIULZIPRES—NOVATE MILANESE

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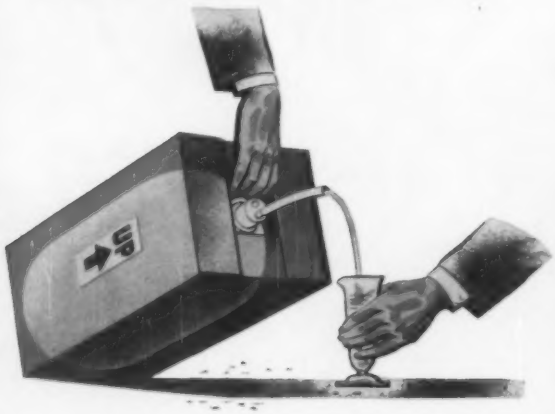
- LUPERSOL® DDM
- t-BUTYL HYDROPEROXIDE-70
- LUPERSOL® DELTA
- t-BUTYL PERBENZOATE

## IN NEW FIVE GALLON POUR SPOUT PEROXY-POLY-PAK



Here's a big step ahead in peroxide packaging. The Lucidol PEROXY-POLY-PAK is a fiber carton with a convenient hand hold housing a five gallon pour spout polyethylene bottle. Lightweight. A new high in pouring accuracy. Won't burp, drip or splash. No vermiculite required. No metal to contaminate contents. No blind corners to prevent complete draining. No leakers. Easily disposed of when empty by burning.

**LUCIDOL DIVISION**

WALLACE & TIERNAN INCORPORATED
1740 Military Road
Buffalo 5, New York


## THE PLASTISCOPE

*(From page 230)*

tion control in the oil industry and low-temperature insulation in the refrigeration industry.

**Modern Plastic Machinery Corp.,** Lodi, N.J., manufacturer of extrusion and other equipment, has leased for 10 years the 80,000-sq. ft. plant in Clifton, N.J., formerly occupied by the Curtiss-Wright Corp. The transaction involved a sum of about $250,000.

**Willard J. Johnson,** a founder of the corporation (who, until recently, has been confined to the hospital since his automobile accident in December, 1957), has retired and is succeeded as president by **Louis Danenberg.**

Mr. Danenberg is a pioneer plastics manufacturer. His **Plastoid Corp.** is prominent in the plastic wire covering industry. Active management of the corporation has been taken over by **Frederick J. Maywald** who, as general manager and director of engineering and research, brings

**Maywald**

**Danenberg**

with him to the company over 20 years of experience in design and manufacture of machinery for plastics and rubber. Other additions to the staff have been **Bruno Menegus,** design engineer; **Cass Gilbert,** sales engineer; and **A. DeLucia,** factory superintendent. In addition, other specialists in this field have been invited to join the staff and will be added from time to time.

The expansion program will also include the construction of a permanent customer service and development laboratory. The company also announced that several new and significant pieces of equipment are now under development and they will be released to the industry within the next few months.

**Cadillac Plastic & Chemical Co.** expanded its production capacity for Cadco cast **(To page 234)**

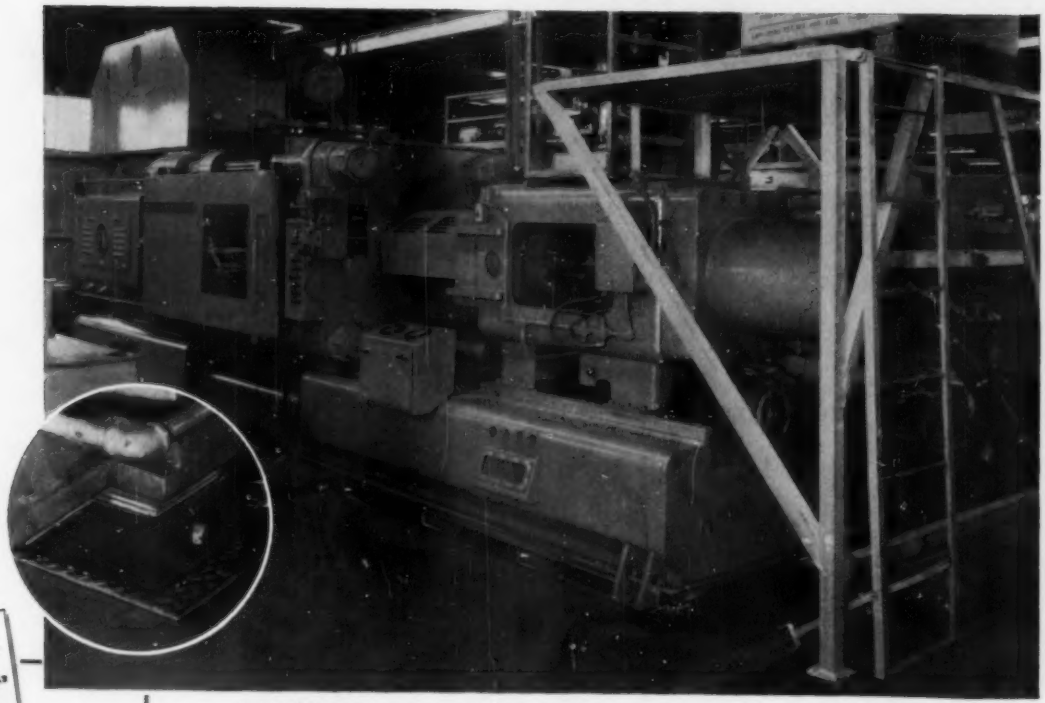
# INJECTION MOLDING MACHINES

# ✓STAY LEVEL ✓STAY PUT

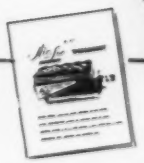
**when you install them on the new**

**Air-Loc® 4·17·4 WEDGMOUNT**

*with patented vinyl, sisal, and cork Air-Loc top and bottom.*



*HPM #800 H-48 Injection Molding Machine installed on twenty WEDGMOUNTS Type S, each 4" x 8". Mounts were installed under the 87,000 lb. machine, adjusted to a level position, and machine is operating perfectly.*



**NEW FOLDER** describes the WEDGMOUNT method, gives sizes available for various types of machines.

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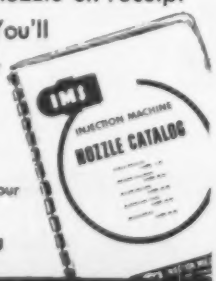



INJECTION MOLDERS SUPPLY COMPANY
3519 LEE ROAD • CLEVELAND 20, OHIO

## THE PLASTISCOPE

*(From page 232)*

acrylic rods and tubes and extruded flat and corrugated sheets by approximately 40 percent.

New facilities at the company's Warren, Mich., plant include centrifugal casting machines, an automatic polishing line, and extrusion equipment.

**American Chemical Corp.**, jointly owned by **Richfield Oil Corp.** and **Stauffer Chemical Co.**, has contracted with **Scientific Design Co.** for design and construction of a vinyl chloride polymer unit at Watson, Calif.

This is the last of four completely integrated units initially planned for at American's $7.5 million southern California facility. Completion of the unit is planned for mid-1960.

American Chemical will manufacture ethyl chloride, ethylene dichloride, vinyl chloride monomer, and polyvinyl chloride resins to meet requirements of western plastics processors and chemical manufacturers.

**The Polycast Corp.** and **Optical Plastics Corp.**, both of Stamford, Conn., have merged. Polycast will be the continuing company and an Optical Plastics Div. has been established by the merger.

Optical Plastics was started in 1945 by **John O. Beattie** to develop and apply casting techniques of monomeric materials to optical applications. Particular emphasis was given to the CR-39 monomer as well as copolymers thereof.

The Polycast Corp. was formed in 1955 under the presidency of Mr. Beattie to engage in the production of cast acrylic and copolymer sheet stock.

The operation of the expanded Polycast Corp. will continue under the management of Mr. Beattie, president and general manager; **Raymond F. Hibbert,** vice-president and sales manager; and **Ruta A. Raudins,** who is the company's vice-president and production manager.

**The Dow Chemical Co.** completed plant facilities for the production of propylene oxide, propylene glycol and dipropylene glycol at its Plaquemine, La., Div. The company also manufactures propylene oxide at its Midland (Mich.) Div. and Texas Div. in Freeport, and propylene glycol is also produced at the Texas Div.

**Plax Corp.** has broken ground for a 40,000-sq. ft. plant expansion at its Deep River, Conn., manufacturing facility. Completion is scheduled for January 1960. The company will also increase the work force at its Ligonier, Ind., plant by 100% over the next six months. Increased demand, particularly by the household chemical industry, for the company's plastics bottles is cited as the reason for these expansions.

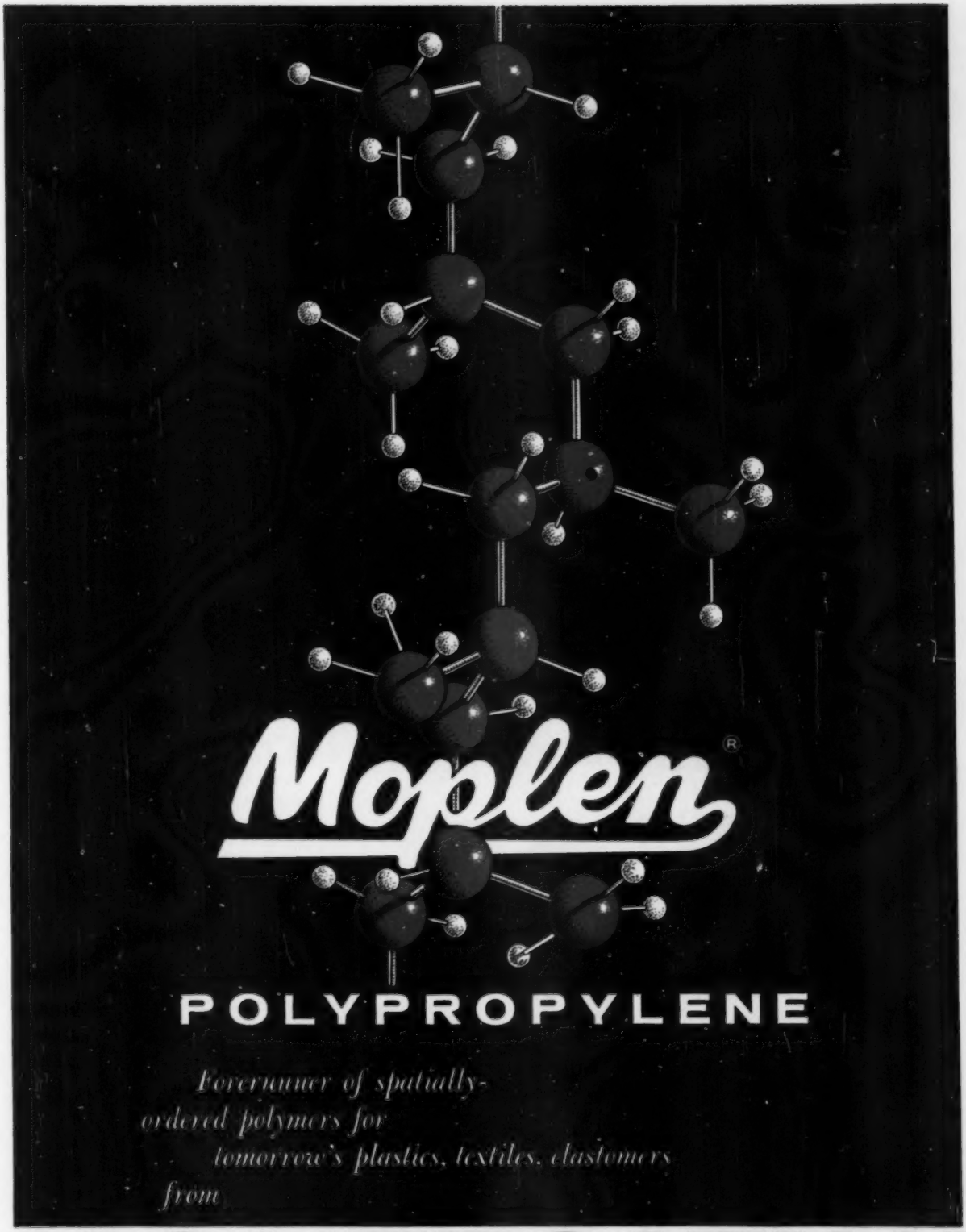
**Imperial Chemical Industries, Ltd., Plastics Div.**, will erect a new plant near Dumfries, Scotland, for the manufacture of Melinex polyester film. The plant will eventually have a capacity of 2000 tons or more a year.

I.C.I., the sole manufacturer of polyester film in the United Kingdom, has been making this product in small quantities at a pilot plant since 1954. When the new plant is in full production in 1960/61, it is expected to supply all the U.K. needs for polyester film and perhaps even permit some export.

**Pamarco, Inc.**, Roselle, N. J., supplier of mechanically engraved printing and applicator roll, completed addition of a fully-equipped gravure engraving division. The new facility produces gravure-engraved rolls for texturing, wood grain, packaging, and decorative effects on film, paper, foil, and floor and wall coverings, up to 216 in. long.

**Formica Corp.**, a subsidiary of **American Cyanamid Co.**, started construction of a new research and product development laboratory at its Evendale, Ohio, plant. The 300,000-sq. ft. building will be located alongside the company's 550,000-sq. ft. manufacturing facility.

The laboratory, which will be staffed by approximately 80 persons, will increase Formica's research and development activity and will consoli- **(To page 236)**

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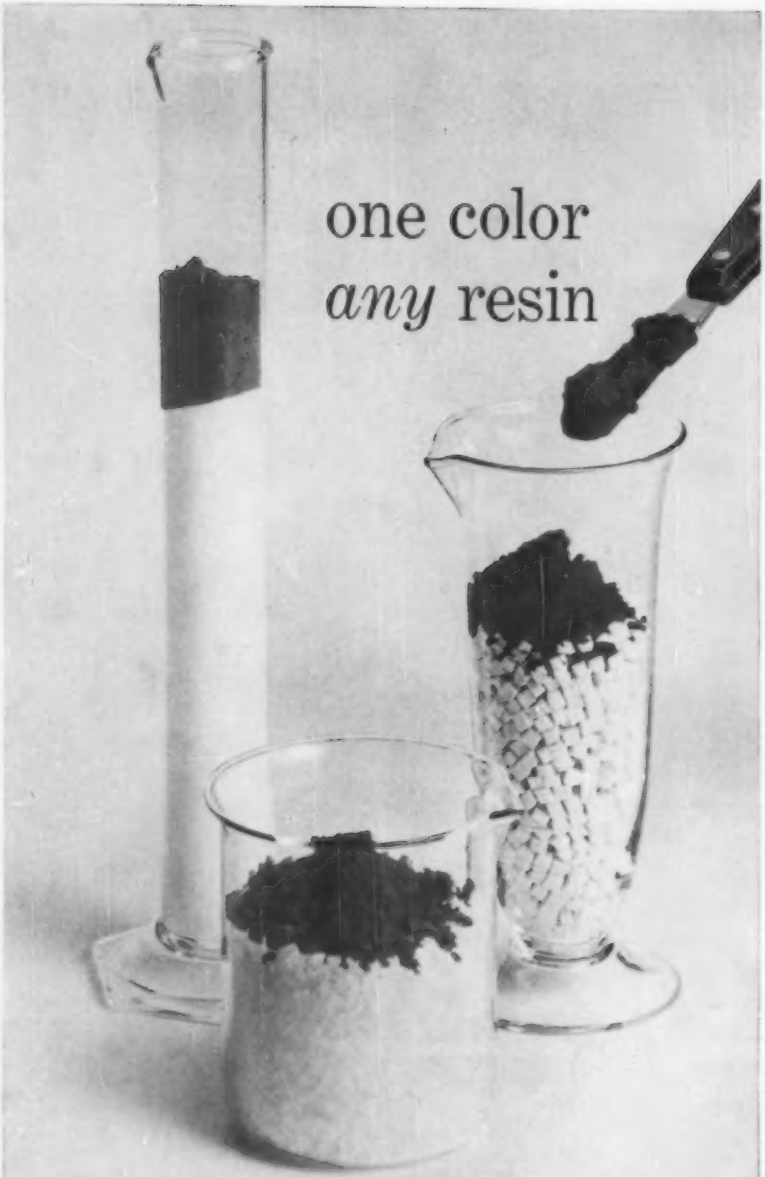


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## THE PLASTISCOPE

*(From page 234)*

date all product development and application work under one roof. The company's basic research will continue to be carried out at American Cyanamid's laboratory in Stamford, Conn.

**Pyrometer Co. of America, Inc.**, Penndel, Pa., formed a **Pycofoam Div.** to perform custom molding of expandable polystyrene. **William L. Parsons, Jr.**, is appointed manager. The new division will operate out of a newly acquired plant near Norristown, Pa.

**The Glidden Co.** is constructing a $600,000 reactor at its Cleveland, Ohio, paint plant. The facility will be one of four to be built in the company's $2,250,000 resin expansion program.

The reactors are of the universal type which will produce all kinds of resins essential to the plastics, paint, and varnish industries. All four units are expected to be in full operation by the latter part of 1960.

**Dorsett Plastics Corp.** will establish a new plant in Indiana for the manufacture of RP boats. The new plant is in addition to production facilities in Santa Clara and San Jose, Calif.

All Dorsett hulls are made with Iso-Glas, a fibrous glass boat-fabrication material made from isophthalic-based resin developed by **Oronite Chemical Co.**

**Shell Chemical Corp.** has broken ground for a new building at 6050-54 W. Touhy Ave., Chicago, Ill., to accommodate the Plastics & Resins Division.

**Fabricon Products,** a Div. of **The Eagle-Picher Co.,** manufacturer of Lamin-Art high-pressure plastic laminate, has occupied its new 10,000 sq. ft. regional headquarters office and warehouse building at 9000 Diplomacy Row, Dallas, Texas. Home offices of Fabricon Products are located in Los Angeles, Calif.

**B. F. Goodrich Chemical Co.** plans to construct a $4,500,000 plant in Australia to make Geon vinyl

materials. The new facility will be built in cooperation with Australian interests, and the basic raw materials will come exclusively from Australian sources.

**Borden Chemical Co.** completed expansion of its Compton, Calif., plant, and will soon install additional manufacturing equipment to gear the facilities for a 25% increase in production of extruded vinyl garden hose in 1960.

Borden is also constructing a 7-million lb./yr. formaldehyde plant in Colombia; recently expanded an Argentine casein plant; and is beginning polyester resin production in Brazil. These are the first steps in Borden's 5-yr. program of planned growth in South America.

**Olin Mathieson Chemical Corp.** has announced a $30 million expansion program that includes several materials for the plastics industry. The plan includes new facilities at Brandenburg, Ky., where glycerin and epichlorohydrin used in production of epoxy resins, and polypropylene glycols used in urethane production, will be among the chemicals produced. Propylene glycol used in polyester resins for reinforced plastics will also be produced there. The company will also expand its chlorine capacity at Niagara Falls, N. Y., and is investing $4 million as its share in a joint venture with Sun Oil to produce urea in Delaware. Vice-president **Edward Block** said that demand for epichlorohydrin and glycerin would be 335 million lb. in the 1962-64 period compared with 250 million now.

**Plastics Industrial Products, Inc.** moved from Somerville, Mass., to Peabody, Mass., thereby increasing production facilities by approximately 200 percent. The company is a custom manufacturer of extruded plastics.

**Carlon Products Corp.** added a $100,000 installation for the production of its Hi-Mol PE pipe at its Aurora, Ohio, facilities. The high molecular weight of the resin (one million) is said to provide a life expectancy of more than 50 years for the pipe, and to assure resistance to environmental stress cracking.

**Moreland Corp.,** manufacturer of printing and industrial rollers for plastics and other materials, has enlarged its Willow Grove, Pa., plant by nearly 30 percent. The addition is devoted exclusively to the production of rollers up to 30 ft. long by 6 ft. in diameter.

**Robbins Floor Products, Inc.,** Tuscumbia, Ala., formed **Robbins Floor Products of Canada Ltd.,** and is constructing manufacturing facilities for the company's vinyl and rubber tile in Granby, Ont. The new plant is expected to go into operation about October 1. **Poncet Davis, Jr.,** president of the American operation, will also be president and chief executive officer of the Canadian firm.

In cooperation with **Ste' Chimique de Gerland** of Paris, a manufacturer of resilient floor coverings in France, **(To page 240)**


## HELPFUL BOOKLETS FREE!

**TECHNICAL DISCUSSIONS OF POLYETHYLENE.** 12-page periodical. Current issue carries articles titled: New Fields for Polyethylene; The Chemistry of Crosslinked Polyethylene; Crosslinked Polyethylene Compounding, Processing, Testing. Also 4 laboratory compounding studies. R. T. Vanderbilt Co., Inc. **(I-905)**

**EXTRUDING EQUIPMENT.** Illustrated 4-page brochure describes an extruder in models offering up to 75 lbs. per hour capacity in sizes of 1 to 6 inches, and lists manufacturing facilities for design, redesign, replacement, development, etc. Killion Tool & Mfg. Co. **(I-909)**

**RIGID POLYETHYLENE.** 24-page booklet discusses the characteristics, advantages, etc., of a rigid polyethylene in several types, and a film. Also discusses technical assistance, development of markets and promotion helps. Phillips Chemical Co. **(I-923)**

**VINYL SOLUTION RESINS.** 16-page booklet discusses preparation, properties and compounding of Geon solution resins for paper coatings, food packaging, strippable coatings, printed inks, etc. B. F. Goodrich Chemical Co. **(I-942)**

**Any of the booklets described here, plus many others—forty-four in all—are available for the asking, without charge or obligation.**

**Just turn to the Manufacturers' Literature Section in this issue (pages 183, 184), circle the numbers corresponding to the booklets you want, fill in the reply postcard, and mail. No postage needed.**

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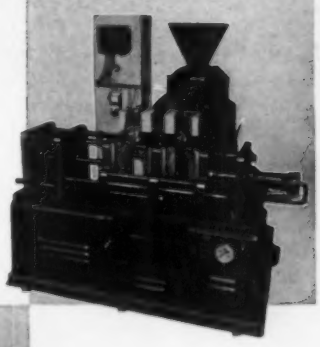

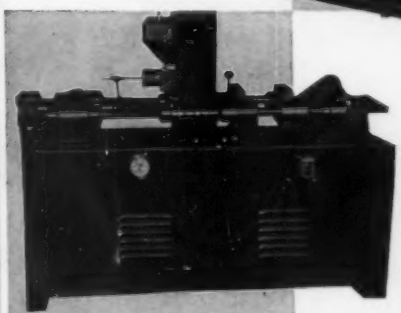

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## P.S. TO PLASTICS SUPPLIERS

The entire American plastics industry uses the Encyclopedia as its standard reference book. The only annual in the industry, it's used day-in, day-out—all year long.

## THE PLASTISCOPE

*(From page 237)*

a new manufacturing plant for Robbins' products is also being constructed at Lyons and is scheduled for early fall completion.

**Plastic Compounding Corp.,** Santa Monica, Calif., plastics reprocessing company, installed a steam heated Banbury Mixer and special high-capacity mixing extruders for blending, compounding, and coloring thermoplastic materials.

**Dyna-Therm Chemical Corp.,** Culver City, Calif., producer of high-temperature protective coatings, has acquired all the assets of **Plas-Kem Chemical Corp.,** Burbank, Calif., producer of vinyl plastisols and organosols. The purchase involved a sum of cash in excess of $250,000.

Plas-Kem will be operated as a wholly-owned subsidiary in Burbank. **Elbert Davis,** former principal stockholder of Plas-Kem, will continue to direct the new division and will become vice-president in charge of research and development for Dyna-Therm Chemical Corp.

**Gilbert Mfg. Co., Inc.,** Long Island City, N. Y., is doubling its production facilities to 70,000 sq. feet. The company maintains integrated facilities for custom molding, including consulting services, research and development, prototype design, and fabrication of all types of moldings and closures.

**A. Schulman, Inc.,** Akron, Ohio, will erect a new plastics reprocessing plant at Orange, Texas. Operations are expected to begin in the early fall.

**Paul Wysynski,** assistant plant superintendent of Schulman's main offices at Akron, has been appointed manager of the new Texas facility.

**Majestic Molded Products, Inc.,** Bronx, N. Y., has transferred the manufacturing facilities of the **Mark-Smith Plastics Corp.,** Paterson, N. J., formerly operated as a division, to the Bronx plant. This move has combined the custom blow-molding and injection molding departments. New and larger equipment has also been added.

**Mark Froot** is no longer affiliated with Majestic's operation.

**Plastic Parts Corp.,** custom thermoformer, moved from Maumee, Ohio, to a newly purchased plant at 1701 Nebraska Ave., Toledo, Ohio. The new facility triples the firm's previous floor space. The company also acquired five additional vacuum forming machines during the move.

**L. B. Smith Aircraft Corp.,** Miami, Fla., added a fibrous glass and plastics manufacturing division to produce custom parts for its own aircraft and aircraft products, and also to produce custom parts for other companies in the industry.

**The Fiberglass & Plastics Mfg. Div.** will be operated by the **Aerosmith Products Div.** of L. B. Smith Aircraft Corp., headed by **Wesley L. Peckham,** vice-president. **John Fuller,** engineer and **(To page 243)**


**PLASTICS CONVERTING TOOLING AND EQUIPMENT**

* * * * *

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The Central Research and Engineering Division has created a new position, Supervisor of Plastics Converting Tooling and Equipment, in its Engineering Department. The work in this position will include the application of prior knowledge and experience in plastic extrusion, bottle blowing, lamination and film manufacture to long range problems; consultation with designers, both in Central Research and Engineering and our Product Divisions; research on radically new methods to insure a leading position for our company's plastic products in the fields of rigid and flexible packaging.

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The qualifications for the position include a Bachelor of Science degree in Engineering or its equivalent in experience and familiarity with the special field of Plastics Converting Tooling and Equipment design; five years industrial experience in the field of plastics converting; a proven ability to work on cooperative projects. A degree in engineering is desirable and will be given preference.

* * * * *

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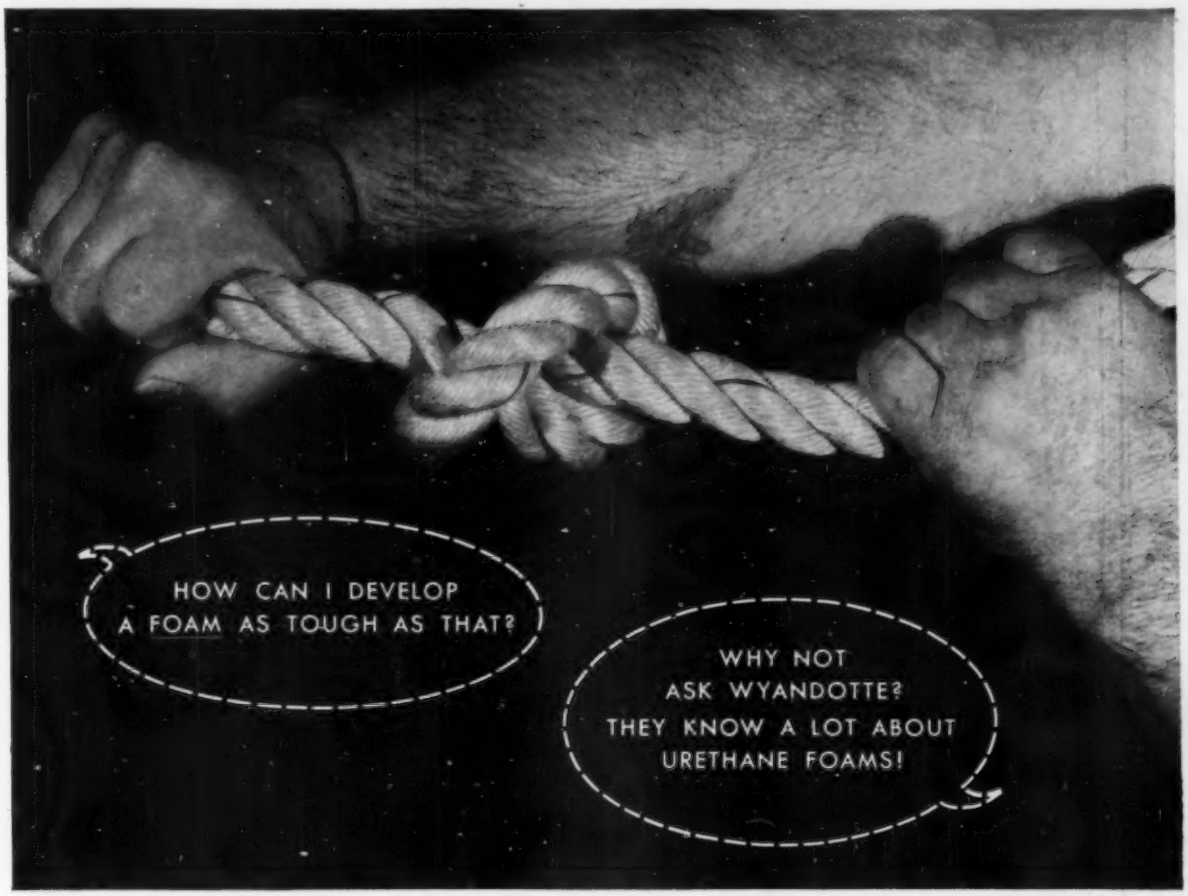


That's right. Wyandotte does know a lot about urethane foams . . . has both the raw materials and the technical background to help you get improved strength properties in your formulation.

Reason: Wyandotte pioneered in the development of the polyethers that have given urethane foams a wider range of desirable properties . . . making possible more accurate control of degrees of toughness, resilience, weight per unit volume, shock absorbency, insulating properties.

Get the specific combination of characteristics you need in your urethane-foam formulation. Call on Wyandotte! If you'll let us know your requirements, we'll furnish samples of appropriate raw materials, and pertinent data. *Wyandotte Chemicals Corporation, Dept. 800-P, Wyandotte, Michigan. Offices in principal cities.*

**Improve your formulation with Wyandotte's urethane-foam raw materials**

**PLURONIC® Polyols** — A series of related difunctional block-polymers terminating in primary hydroxyl groups possessing increased reactivity in polyurethane formulations.

**PLURACOL® P Diols** — A series of polypropylene glycols which impart excellent resilience and strength properties to flexible foams.

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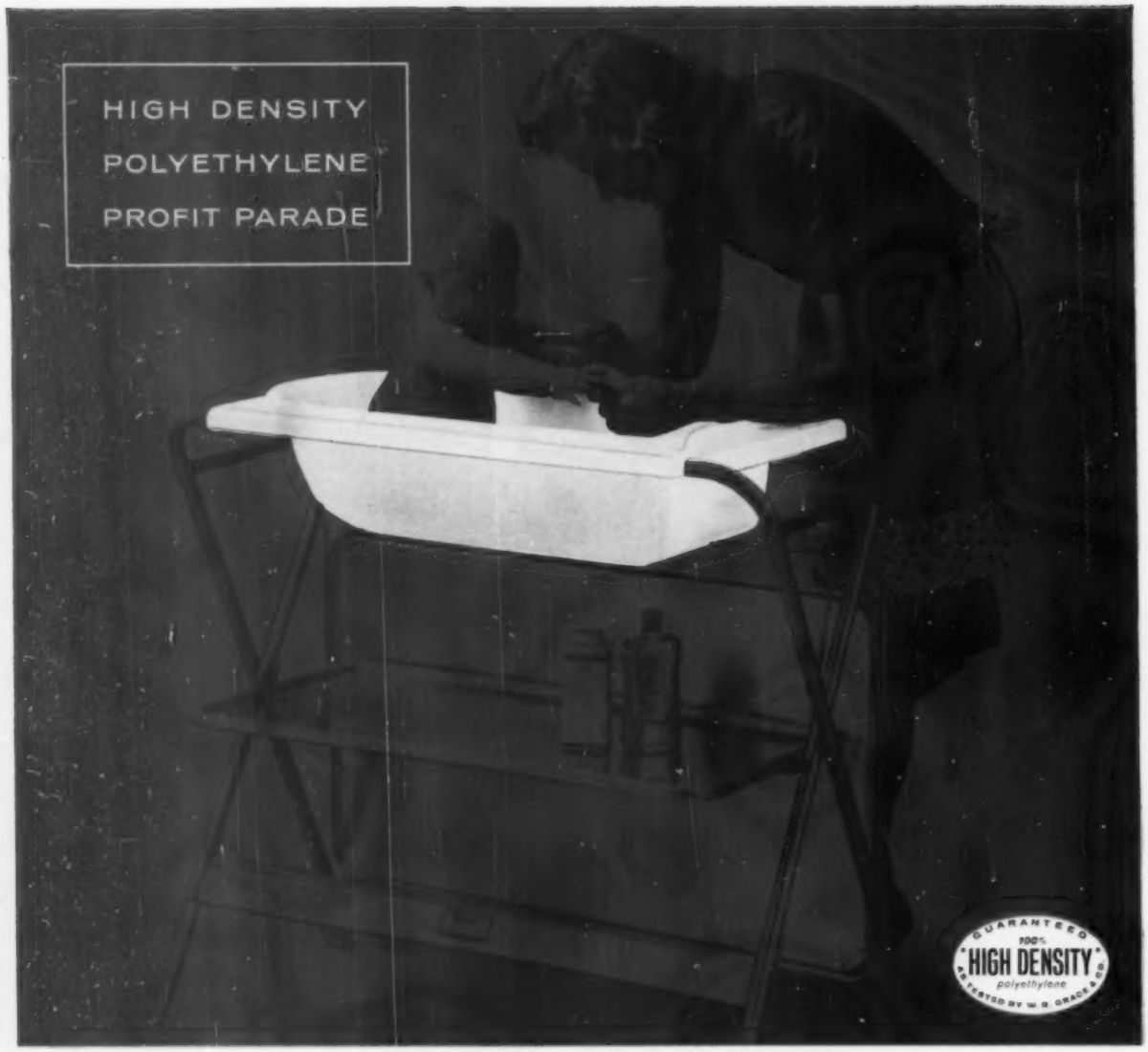



# Exclusive Selling Advantages Offered in Lifetime Tub

Products in many different fields are gaining an edge over competition by utilizing the benefits of Grex high density polyethylene. The "Lifetime Tub" by Baby Bathinette Corporation is an example that really holds water.

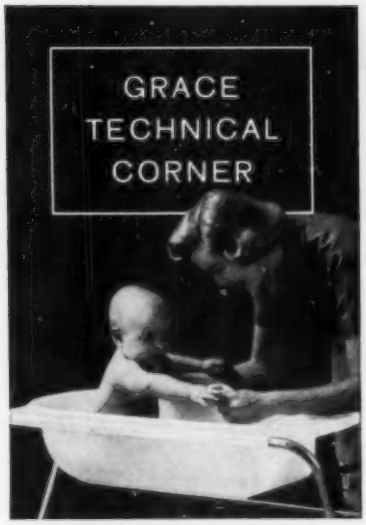
This well-known manufacturer chose Grex to make a tub that would outlast competitive models since this is a tough plastic that is virtually indestructible. They used its molding characteristics to obtain a soft, pleasant, easy-to-clean texture. They took advantage of its strength and rigidity to make the tub light in weight for greater ease of carrying.

This new Grace plastic offers a unique combination of properties to help you create unique selling advantages. It takes a beating without chipping, cracking or breaking. It can be molded in any color and decorated. It resists the elements and most corrosive chemicals. And it is the only thermoplastic that takes boiling or freezing without losing its shape or strength.

If you need an idea of how to gain an edge over competition by using high density polyethylene be sure to call in the experts. Grace has the production facilities, technical service and experience to help put your product in the Grex profit parade. We're easy to do business with.

*Grex is the trademark for W. R. Grace & Co.'s Polyolefins.*

W.R. GRACE & CO.
POLYMER CHEMICALS DIVISION
CLIFTON, NEW JERSEY




Grex answers design and molding problems on extra-large piece.

Don't let size limit your thinking when designing or molding with Grex high density polyethylene. The "Lifetime Tub" shown here is 30½" x 6½" x 19"—one of the largest pieces so far injection molded with this Grace plastic. Some of the technical thinking that went into this job may give you an idea of how to get the most from Grex.

*Cost a design factor.* Production of a piece as large as this tub invariably presents a cost problem. Taking advantage of the way Grex performs in thin wall sections, the designers were able to keep the amount of resin per tub to a minimum and permit economical cycle times. Use of thin walls, however, called for a design that would not only take care of the weight of baby and water but also provide for satisfactory suspension of the tub in its metal frame. Reverse curves solved both problems and minimized use of ribs and fillets to avoid heavy sections, sinks and depressions.

*Mold surface.* Depending on mold surface, Grex takes any finish ranging from high gloss to matte. In this case, it provided a smooth, pleasant texture—essential to protect baby and make cleaning easy—through the use of a highly polished chrome-plated mold.

*Molding technique.* Production of the tub involved a 3-pound shot of Grex, a large mold cavity and thin wall sections. Under these conditions, multigating was chosen over normal gating. With four gates the cavity was filled faster and strain reduced.

*What are your problems?* If you have a job in mind for high density polyethylene count on Grace for help. Now's the time to call, wire or write:

Technical Service Department,
Polymer Chemicals Division,
W. R. Grace & Co., Clifton, N. J.

## THE PLASTISCOPE

(*From page 240*)

former consultant to General Motors, Ford Motor Co., and to the military at Cape Canaveral, Fla., and White Sands Proving Grounds, N. M., will head the fibrous glass and plastics manufacturing division.

**Beetle Plastics Corp.,** a subsidiary of **Crompton & Knowles Corp.,** started full-scale production of reinforced and structural plastics at its Fall River, Mass., plant. The company will produce a variety of items from small electronic components to 4500-gal. mobile tankers. Beetle has built sonar domes for the atomic submarines, and has supplied 55-ft. radar domes for the DEW line.

### Deceased

**Leonard Smidth,** 60, holder of inventions and patents in the urea-formaldehyde molding compound field now held by **Sylvan Plastics, Inc.,** a subsidiary of **American Viscose Corp.,** died July 20. Dr. Smidth's "straight urea molding material" was sold as Aldur in 1929-30 by **Luco Products Corp.** Sylvan Plastics was organized in 1941 to develop his products in the urea-formaldehyde field.

**Frank W. Egan,** 67, founder and chairman of the board of directors of **Frank W. Egan & Co.,** Somerville, N. J., and one of the foremost authorities on paper coating and laminating, died July 29.

**F. W. Egan**

With his two sons, **Edward F. Egan** and **Lawrence W. Egan,** president and vice-president respectively, Mr. Egan formed the company which bears his name in October, 1946. He had previously been vice-president of the John Waldron Corp., which is located in Highland Park, N. J.

## Meetings

### Plastics groups

**Oct. 1, 2:** The Society of the Plastics Industry, Inc. (S.P.I.), 15th New England Section Conference, Wentworth-by-the-Sea, Portsmouth, N. H.

**Oct. 7:** Society of Plastics Engineers, Inc. (S.P.E.), Cleveland Section, Retec "Vinyl Plastics," Cleveland Engineering Society Bldg., 3100 Chester Ave., Cleveland, Ohio.

**Oct. 13, 14:** S.P.E. Natec "Plastics Engineering—State of the Art Today," Ambassador Hotel, Los Angeles, Calif.

**Oct. 16:** S.P.E., Buffalo Section, Retec "Plastics Finishing," Hotel Niagara, Niagara Falls, N. Y.

**Oct. 17-25:** "Kunststoffe 1959," International Fair of the Plastics Industry, Düsseldorf, Western Germany. Also concurrent technical sessions.

**Nov. 4:** S.P.E., St. Louis Section, Retec "Plastics Applications in the Shoe Industry," Statler Hotel, St. Louis, Mo.

**Nov. 19, 20:** (British) Plastics Institute, "The Influence of Plastics in Building," Royal Institute of British Architects, 66 Portland Pl., London W.1, England.

**Nov. 19:** S.P.E., Golden Gate Section, Retec "Plastics in Packaging," San Francisco, Calif.

### Other meetings

**Sept. 17-19:** University of Arizona, Industrial Plastics Conference, Tucson, Ariz.

**Sept. 21-23:** Technical Association of the Pulp & Paper Industry, 14th TAPPI Paper-Plastics Conference, Edgewater Beach Hotel, Chicago, Ill.

**Oct. 1, 2:** University of Wisconsin, Engineering Institute on "Industrial Adhesives Applications," Madison, Wis.

**Oct. 6, 7:** University of Wisconsin, Engineering Institute on "Advances in Plastics Molding Technology," Madison, Wis.

**Nov. 16-19:** Building Research Institute, Fall Meet "Curtain Walls, Sandwich Panels," including workshop on "Sandwich Panel Design Criteria," Shoreham Hotel, Washington, D. C.

**Nov. 17-20:** Packaging Machinery Manufacturers Institute, "PMMI Show 1959," Coliseum, New York, N. Y.—**End**

# A NEW HERCULES PLASTIC!

**TYPICAL PROPERTIES OF HI-FAX**

| | |
|---|---|
| Crystalline melting point, °F. | 268 |
| Specific gravity | 0.945-0.947 |
| Mold shrinkage, in./in. | 0.022-0.028 |
| Water absorption, % | 0.03 |
| Heat-distortion temperature (66 p.s.i.), °F. | 144-154 |
| Deformation under 2000-lb. load for 6 hr. at 122°F., % | 9-16 |
| Hardness, Rockwell R | 35-40 |
| Impact, Izod, ft.-lbs./in., notched | 1.5-12 |
| unnotched | >32 |
| Tensile yield stress at 73°F., p.s.i. | 3450-4500 |
| at 212°F. | 1300-1800 |
| Ultimate elongation at 73°F.,% | 100-700 |
| Dielectric constant | 2.33 |
| Power factor | 0.0007 |

First of the new Hercules family of plastics, Hi-fax is the Hercules trademark for high-density polyethylene. As produced by an exclusive process, it is superior in many ways to other high-density materials. As a result, Hi-fax offers important advantages to producers in the markets where it now serves. Its superior properties, combined with the outstanding processing economies it affords, yield quality, low-cost products.

**Blown containers:** Hi-fax is now the standard material by which all plastics used in blown bottles and containers are judged. It provides outstanding performance and economy, especially in products designed to package corrosive materials, offering a high degree of stress-crack resistance coupled with lightweight strength in thin-wall sections.

**Industrial shapes:** Excellent processability, outstanding low temperature resistance, dimensional stability, and durability in long-term use are characteristic of the many industrial parts now being fabricated with Hi-fax by extrusion and injection molding.

**Wire:** Wire and cable coatings made with Hi-fax provide a toughness and resistance to abrasion superior to almost any other plastic or rubber.

**Pipe:** A special pipe grade of Hi-fax yields a low-cost, thin-wall flexible pipe, NSF approved, and setting new standards for quality in flexible piping. Extruders have found it offers many processing advantages over competitive materials.

hi-fax®

*Flexible Pipe*

*Wire and Cable Coatings*

*Containers*

*Cosmetic Packaging*

*Detergent Bottles*

***Want to know more about Hercules' NEW PLASTICS? For complete property and use data, or specific information on any of the products shown here, call or write:***

# ANOTHER NEW HERCULES PLASTIC!

*Hospitalware*

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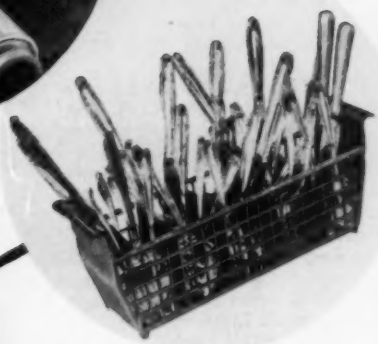

*Product Components*

pro-fax®

Pro-fax, the bright new name in thermoplastics, is the Hercules trademark for polypropylene. With a high softening point, Pro-fax is dimensionally stable at temperatures as high as 300°F. It has a hard, glossy surface finish, and is available in a full range of opaque and translucent colors. With a specific gravity of only 0.9, *Pro-fax is the lightest of all plastics,* providing a production bonus of many extra parts per pound over other materials in its same price-property class.

**Pro-fax for injection molding:** Pro-fax is an excellent general-purpose material now finding broad use in such markets as closures and containers, automotive and appliance parts, valves and fittings, housewares, toys, and sporting goods. Pro-fax molds rapidly and well, has only half the shrinkage of high-density polyethylene.

**Pro-fax for extrusion:** Pro-fax monofilaments are now in growing use in rope, fish nets, seat cover fabrics, outdoor furniture webbing, bristles, pen tubes, and a variety of industrial parts. Extruded Pro-fax sheet provides a splendid structural material for vacuum-forming, thermoforming, and fabrication. Pro-fax film for packaging has sparkling clarity, outstanding toughness, and excellent resistance to permeation.

**TYPICAL PROPERTIES OF PRO-FAX**

| | |
|---|---|
| Crystalline melting point, °F. | 333 |
| Specific gravity | 0.901 |
| Mold shrinkage, in./in. | 0.015 to 0.020 |
| Water absorption, % | 0.03 |
| Heat-distortion temperature (66 p.s.i.), °F. | 221 |
| Deformation under 2000-lb. load for 6 hr. at 122°F., % | 2.0 |
| Hardness, Rockwell R | 93 |
| Impact, Izod, ft.-lbs./in., notched | 1 |
| unnotched | >17 |
| Tensile yield stress at 73°F., p.s.i. | 4970 |
| at 212°F. | 1720 |
| Ultimate elongation at 73°F., % | >220 |
| Dielectric constant | 2.0 |
| Power factor | 0.0003 |

CP 59-10

HERCULES POWDER COMPANY
INCORPORATED
WILMINGTON 99, DELAWARE

# COMPANIES...PEOPLE

Appointments, promotions, and relocations in the plastics industry.

**Celanese Corp. of America** organized three new companies to administer the manufacture and marketing of its plastics products, chemicals, and fiber. The companies will function as operating divs. of the parent firm.

**Richard W. KixMiller**, previously VP in charge of the former chemical div., named pres. of **Celanese Plastics Co.** and **Celanese Chemical Co.** The two organizations will continue to function separately and independently. **John W. Brooks** is pres. of **Celanese Fibers Co.**

R. KixMiller

W. P. Orr

**William P. Orr**, previously asst. gen. mgr. of the former plastics div., named VP of Celanese Plastics Co. **James H. Worth** promoted from asst. gen. mgr. of the former chemicals div. to VP of Celanese Chemical Co.

**Phillips Chemical Co.**, subsidiary of **Phillips Petroleum Co.**: **C. R. Scott** becomes New York dist. plastics sales mgr. with headquarters in New York, N. Y., succeeding **W. C. Douce**, who is now asst. dir.—rubber chemicals sales div., with headquarters in Bartlesville, Okla. **L. A. Grundy**, dist. sales engineer in Providence, R. I., replaces Mr. Scott as New England dist. plastics sales mgr., Providence, R. I.

**The General Tire & Rubber Co.**: **John J. Denbrock** named asst. to the VP in charge of plastics, where he will work closely with General's Bolta, Textileather and Jeannette plastics operations on all sales, advertising, and merchandising. **Wayne Thorne** appointed mgr. of the building materials div. and **Alfred G. Turner** is mgr. of wall and countertop material sales.

**G. Felsenthal & Sons, Inc.**, Chicago, Ill., molder and fabricator of plastic industrial components, sold a substantial amount of capital stock in the company to the **J. L. Clark Mfg. Co.**, Rockford, Ill., which is a producer of lithographed metal containers and specialties.

Felsenthal officers and staff will continue to operate the business with Clark representation on the board of dirs. **Ben W. Rau** remains as pres. and gen. mgr. **Earl R. Keown** continues as VP and sales mgr., both retaining their complete stock interest and continuing as dirs. No changes in organization are contemplated and none of the present operations will be affected, the company states.

**Oronite Chemical Co.**, a subsidiary of **Standard Oil Co. of Calif.**: **Dr. R. I. Stirton** named gen. mgr. of the newly-created commercial development dept. **Dr. W. E. Elwell** appointed mgr., market development; **K. J. Van Arnum** is mgr.—market research; and **R. E. Echols** named supv., market development.

**Borden Chemical Co.**: **A. N. Stull** promoted from gen. mgr. of the Coatings & Adhesive Dept. to asst. VP—tech. service. He will move his headquarters from Peabody to North Andover, Mass. **Henry L. Schmidt**, formerly operations mgr. of the company's five Resins & Chemicals Dept. plants, succeeds Mr. Stull at Peabody.

**The Dow Chemical Co.—Plastics Dept.**: **Fred K. Quigley, Jr.**, promoted from asst. mgr.—coatings tech. service to staff mgr.—coating materials. He succeeds **E. K. Stilbert**, recently named a product group VP of **Dow Chemical International, Ltd., S. A.**

**William A. Dunlap**, previously a staff member at plastics tech. service facilities at the **Dow Texas Div.**, Freeport, Texas, advanced to mgr.—plastics tech. service in the South. He succeeds **Robert W. VanSickle**, mgr. of a new polyethylene film plant at Findlay, Ohio.

**R. J. Adam** appointed mgr.—plastics sales at Buffalo, N. Y.

**Coatings Tech. Service.**: **M. C. Carpenter**, formerly head of the latex paint section, advanced to mgr. of the paint industry group. **James L. Huffman** directs the new trade sales section. **R. B. Drubel** heads the new industrial section, which will carry on developmental work within the industrial segment of the paint industry with latexes, vinyl resin lacquers, plasticizers, ethyl cellulose lacquers, monomers for modification of oils and alkyds, resin intermediates for paint, epoxy resins for surface coatings, and polyesters.

**B. F. Goodrich Chemical Co., Div. of The B. F. Goodrich Co.**: **Edward G. Schwaegerle** named mgr. of synthetic resin development at the Avon Lake, Ohio, development center. He joined the company in 1942 as a Jr. chemical engineer in the process control lab. in Akron. In 1943 he was transferred to a newly organized vinyl resin group, and in 1952 was promoted to Sr. tech. man. That same year he was named development supv. of the group which has developed most of the vinyl resins now sold by the chemical firm.

Schwaegerle

**William H. Heinlen** has been named marketing mgr. for the international dept.

**Shell Chemical Corp.** has reorganized its Union, N. J., tech. service lab. along product lines.

Appointed under **F. S. Swackhamer**, lab. dir., as mgrs. are **C. M. Reider**, plastics and resins; and **R. F. Buller**, industrial chemicals. **E. F. Eckman**, formerly office mgr. of the lab., named mgr.—admin. services.

**Chicago Molded Products Corp.**: **Anthony Czarnecki** named field sales mgr. of the custom molded div. **Robert C. Henderson** joined the company's Cloverlane molded dinnerware div. as commercial dinnerware field sales mgr. **James R. Davidson**, formerly with Capac Industries, is now a sales rep. for the custom molded and Campco divs.

**Spencer Chemical Co.**: **Kenneth A. Spencer**, formerly pres., elected chrmn. of the board and chief exec. officer. **C. Y. Thomas,** **(To page 249)**

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**Bernard J. Farina**

With deep sorrow, Breskin Publications, Inc. announces the loss of a veteran and valued staff member. Bernard J. Farina, assistant production director of MODERN PLASTICS and MODERN PACKAGING, died suddenly July 21 in New York Hospital of complications following an operation. He was 44 years old.

"Ben" joined this organization in 1938, starting in the Shipping & Receiving Department. Later, he was placed in charge of touring exhibits for both magazines, and became widely known throughout the country. For the last 10 years he had been assistant director of the Production Department. He was respected for his ability and efficiency and loved for the warmth of his personality.

Mr. Farina lived in Massapequa, N. Y. He is survived by his wife Jeanette, and two daughters, Marie and Barbara.

# 10 NRM EXTRUDERS
## IN LESS THAN 10 YEARS,
## for CRESCENT PLASTICS, INC.
Evansville, Indiana

NRM 4½" Electrically Heated Plastics Extruder recently delivered to Crescent Plastics, Inc.

Five years ago Crescent Plastics, Inc. commented to NRM: "We've *standardized* on NRM Extruders because we believe them to be the most efficient machines on the market." That Crescent Plastics still feels the same way is evidenced by C. J. Young, Vice President, at left in the photo, as he expresses his pleasure to NRM Sales Engineer, W. G. Potts, over the performance of Crescent's tenth NRM.

Crescent Plastics, Inc., custom extruders and makers of nationally distributed "Cresline" Plastic Pipe, has a long experience upon which to base its preference for NRM Extruders. The firm started in business in 1949, with total assets being one 2½" NRM Extruder, and plenty of plastics "know-how." Today, in a large, modern plant, Crescent's "custom extrusions for every purpose" are backed up by complete service from design and development, die-making and extrusion, to on-schedule deliveries.

There are many reasons why Crescent Plastics, Inc., and other leading plastics producers all over the world, *standardize* on NRM Extruders and Accessories. Low operating cost, minimum maintenance, close-tolerance extrusions of high quality and fine finish, and high output rates over a long service life, are just a few. They appreciate, too, the engineering, development, and *company service* that stands behind every NRM Product. It is their assurance of more profitable extrusion at less cost and trouble.

Contact us for full engineering information on the NRM Extruder line, or to arrange demonstrations. There's no obligation.

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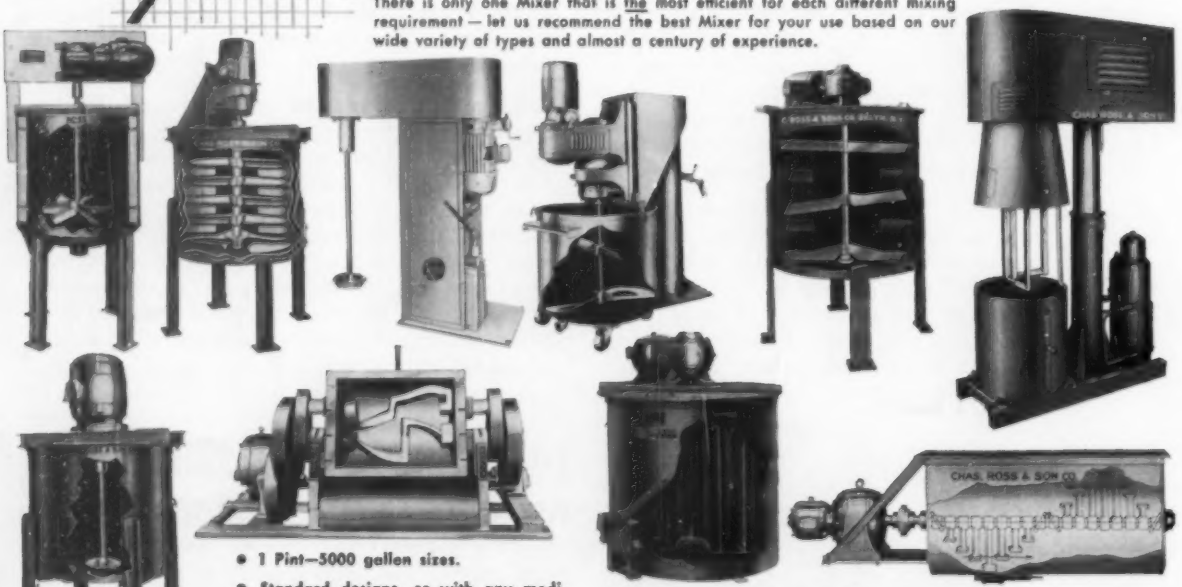


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Leading mfgrs. of wet or dry grinding Mills, Kneaders and Mixers of all types—since 1849
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*(From page 246)*

formerly gen. VP—operations, named vice-chrmn. of the board. **John C. Denton,** formerly VP—Agricultural Chemicals Div., is now pres.

**Joe E. Culpepper,** promoted from VP—marketing to senior VP—marketing. **C. W. "Bill" Brooks,** formerly West Coast sales rep., appointed Nylon product mgr. He is succeeded by **Paul J. Casabonne.**

Spencer reported sales of $57,584,334 for the fiscal year ended June 30, 1959, compared with $45,148,936 in the previous fiscal year. Sales of plastics products accounted for 38% of the company's net sales.

**Bee Chemical Co.,** Chicago, Ill.: **L. A. Dickinson** named mgr.—Eastern sales operations for the company's line of plastisols and coatings.

Bee established new East Coast sales headquarters at 119 Ann St., Hartford 3, Conn.

**Extrudo-Film Corp.,** Long Island City, N. Y.: **Joseph S. Persaud,** previously with Chester Packaging, Div. of St. Regis Paper Co., joined as asst. sales mgr. for the Midwest.

**V. Gregory Stanton** named sales rep. in the company's New York, N. Y., office.

**Plax Corp.: L. E. Gaines, Jr.** appointed sales mgr. for the Cincinnati, Ohio, dist.

**David L. Anderson** named asst. dist. sales mgr. for Chicago, Ill., dist. with headquarters at 911 Busse Hwy., Park Ridge, Ill.

**U. S. Industrial Chemicals Co., Div. of National Distillers & Chemical Corp.: Edward C. Richardson** appointed Chicago, Ill., sales mgr. He replaces **George H. Stanton,** now dir.—field sales. **Jesse H. Hallowell** named Boston, Mass., sales div. mgr.

**Enjay Co., Inc.: Robert F. Dix** elected a VP and head of the products managements dept., which includes the plastics, chemicals, additives, and butyl divs., and the Enjay Labs. in Linden, N. J.

**Diamond Alkali Co., Plastics Div.: Phillip I. Johnson** promoted from sales rep. to the newly created post of products mgr.—suspension resins. He is succeeded in the New York, N. Y.,-Wilmington, Del., area by **Peter W. Rizzo.**

**Jack E. Zimmerman,** formerly asst. mgr.—R & D, named tech. supt. of the div.'s Deer Park, Texas, plant. **Richard E. Mortberg** named sales rep. in the Chicago, Ill., area.

**Swedlow Inc.: K. G. Granger** appointed mgr., Eastern contracts dept., with headquarters in Youngstown, Ohio. He will be responsible for the merchandising of **(To page 250)**

Dynisco's new pressure transducer (Model PT58), developed at the request of a large manufacturer, is specifically designed for use in accurately sensing pressure fluctuations in the melt in thermoplastic extruders. Controlled pressure insures uniformity and enhances the quality of the extruded product.

Actual field applications have substantiated our claims. Model PT58 eliminates the inaccuracies and inconveniences of present pressure sensing methods. Model PT58 gives you:

- **FAST AND ACCURATE PRESSURE RESPONSE**
- **HIGH RESOLUTION**
- **WIDE TEMPERATURE RANGE**
  **Melt temperatures up to 750°F**
- **FULL PRESSURE RANGE**
  **0-1000 to 0-10,000 psi**
- **STURDY CONSTRUCTION**
- **ELECTRICAL OUTPUT FOR RECORDING, REMOTE INDICATION, AND CONTROL**

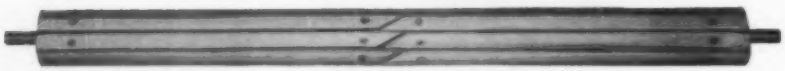
The transducer contains an external jacket for circulation of coolant. It is available in two stem lengths and mounts in a standard ½-20 NF threaded fitting — widely used in the extrusion industry for melt thermocouples and pressure gauges.

*Complete details available, request Bulletin No. 258*

**DYNAMIC INSTRUMENT CO., INC.**
**42 CARLETON STREET CAMBRIDGE 42, MASS.**

# FOR WRINKLE-FREE CONTINUOUS-ROLL OPERATION

**KAY ANTI-WRINKLE SLAT EXPANDER**



By guarding your plastic film processing line against wrinkling, the Kay Slat Expander

1 allows faster, more efficient machine operation
2 reduces losses through rejection
3 assures tighter, neater rolls
4 assures higher-quality printing and closer register

The Kay Slat Expander is supplied with wooden slats for use at room temperatures and aluminum for use in ovens, up to 550°.

Write for a data sheet which gives full information about the Kay Slat Expander and its applications.

**KAY MACHINE COMPANY INC.**
EXPANDERS AND ROLLERS
132 Paterson Avenue E. Rutherford, N. J.

---

# CUSTOM TAKE-OFF for CUSTOM EXTRUDERS

PLASTIMASTER . . . developed in an extrusion plant to meet the custom extruder's specific needs!

- *Four* driven rollers apply maximum draught . . . minimum pressure
- Specially shaped rollers available
- Handles any shape, with least possible distortion
- One-point roller adjustment
- 0" to 5" capacity
- 11.75 to 238 ft/min., roller surface
- Fingertip speed control

Write for illustrated brochure giving complete description and specifications.

**PLASTIMASTER** H & T MACHINE WORKS, INC.
11365 Humble Road, Houston 16, Texas


## COMPANIES...PEOPLE

*(From page 249)*

products in the aircraft and missile fields in the eastern part of the United States. **C. M. Phinny** named to a similar position as mgr., western contracts dept., with headquarters in Los Angeles, Calif.

**R. H. Fisher** appointed sales mgr. for commercial products, which include Kevinite, the company's continuous flexible plastic laminate for decorative surfaces, and photo-templet glass cloth for engineering reproduction purposes. **Carey Carpenter** is mgr. of the newly-created tech. service dept., and will be in charge of the company's applications and design advisory activities for users of Swedlow products.

**The Mead Corp., Hurlbut Paper Co.,** South Lee, Mass.: **Engelbert F. T. Krichels** elected VP—mfg. and **James M. Burt,** VP—sales.

**Phillips-Foscue Corp.,** High Point, N. C., mfrs. of urethane foam materials: **Dr. Aubrey Nease** elected pres., succeeding **Earl N. Phillips,** who was named chrmn. of the board and of the exec. committee. Dr. Nease is also pres. of **Nease Chemical Co.**

**Dr. Christopher Wilson** is VP—R & D, assisted by **Milton Heffler. John Hailey** named gen. plant mgr. in addition to his duties as VP—sales. **James E. Foscue** continues as secy.-treas.

**Camden Associates, Inc.,** Salem, Mass.: **Robert H. Hurley,** formerly mgr.—central styling for the plastics divs. of The General Tire & Rubber Co., elected pres. **Wallis E. Stuart, III,** previously chief designer at General Tire, is VP.

Camden provides a complete consultation service in surface, shape, product, and package design.

**Kem Plastic Playing Cards, Inc.: Joseph F. Artmann** promoted from gen. plant mgr. to VP. **Sara Hudson Cote,** who joined the company as a stenographer in 1946, was also promoted to VP.

**Lynch-Robbins Corp.** is the new corporate name of **Robbins Plastic Machinery Corp.,** Anderson, Ind.

**Dr. Paul Moeller,** formerly sales mgr. of the Plastics Div., Celanese Corp., joined **AviSun Corp.** as mgr. of special projects.

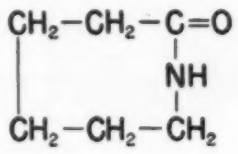
**William M. Thaler,** present mgr. of the Osaka, Japan, branch, promoted to dir.—Far East Operations of **Omni Products Corp.**

**L. P. Raubenheimer,** pres. of **National Paper Box Mfrs. Supplies Assn.,** re-elected to head the organization for the ensuing **(To page 252)**

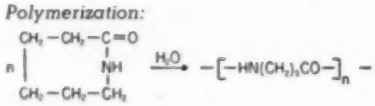
# Development Chemist's Dream!

## National ε-CAPROLACTAM

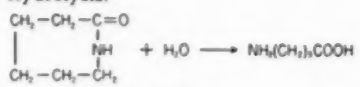
**building block for completely new organics**



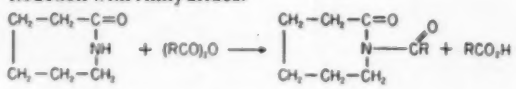
*Polymerization:*



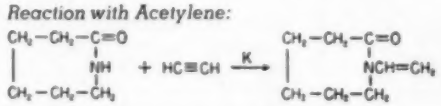
*Hydrolysis:*



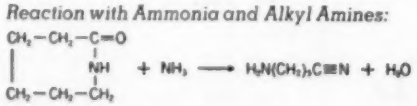
*Reaction with Anhydrides:*



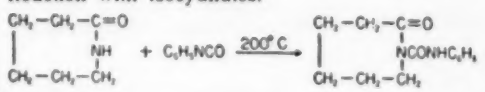
*Reaction with Acetylene:*



*Reaction with Ammonia and Alkyl Amines:*



*Reaction with Isocyanates:*



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Consider its unique 7-membered ring, its polymer-forming potentialities . . . its reaction possibilities with other chemicals to create new materials useful to science and industry.

And then remember that this unique monomer is already priced low enough for volume use in resins and fibers.

**Send for Technical Bulletin I-14R**

Substantial product-development work is being done with National ε-Caprolactam. A considerable body of basic research data already exists. To encourage still wider interest, National Aniline has compiled a new 34-page brochure containing complete properties, known reactions, suggested uses and a comprehensive bibliography. Samples and additional technical help are available to those whose work may develop broader use of National ε-Caprolactam.

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## COMPANIES...PEOPLE

*(From page 250)*

year, as well as elected a dir. of the **National Paper Box Mfrs. Assn.**, and was chosen chrmn. of the Associate Members' Div. He is pres. of **Peter Partition Corp.**, Brooklyn, N. Y., mfrs. of cardboard partitions for protective packaging.

**William L. Rodich** appointed pres. of **Continental-Diamond Fibre Corp.**, a wholly owned subsidiary of **The Budd Co.** Mr. Rodich came to Budd from Celotex, Chicago, Ill., where he was VP of Operations. Prior to joining Celotex, he was gen. mgr. of General Electric Co.'s Laminated & Insulated Products Department, Coshocton, Ohio. He also served as chairman of the Laminated Products Section of NEMA.

**W. L. Rodich**

**Robert W. Gutheil** elected pres. and chief exec. officer of **Standard Insulation Co., Inc.**, East Rutherford, N. J.—a wholly owned subsidiary of **C. H. Dexter & Sons, Inc.**, Windsor Locks, Conn. He was formerly with Armour & Co. as gen. mgr. of the Adhesive Div.

**Lewis C. Kleinhans**, formerly principal stockholder and pres. of Standard Insulation Co. continues as a consultant to management.

**George E. Bailie** appointed dir.—new products planning for **Visking Co., Div. of Union Carbide Corp.**

**Robert J. Jacobs** named gen. mgr. of **John Waldron Corp.**, New Brunswick, N. J., and **Hartig Extruder Div.**, Mountainside, N. J. Both companies are units of **Midland-Ross Corp.**

**Dr. Paul H. Margulies**, mgr. of the metals section at the central research laboratories, **Food Machinery & Chemical Corp.**, Princeton, N. J., chosen president-elect of the **Etched Circuits Society.**

**Paul W. Mitchell** joined **Mobay Chemical Co.** as mgr. of tech. service for Merlon polycarbonate resins. Mr. Mitchell was formerly a research specialist with Monsanto Chemical Co.'s Plastics Div. located in Springfield, Mass.

He has been associated with the polycarbonate venture since November, 1957, when he was placed on special assignment to Mobay by Monsanto to head a tech. planning committee as well as to study potential markets.

**Sir Alexander Fleck**, K.B.E., F.R.S., who will attain the age of 70 in November, will retire as chrmn. and resign from the **(To page 254)**

This G/W Techniplanner kit includes molded thermoplastic parts for a wide diversity of office "space control" layouts.

# In Precision Molded Thermoplastics

## by *Quinn Berry* of Course

Bringing to life before the customer's eyes his complete office layout, The Globe-Wernicke Co. uses these Quinn-Berry precision molded thermoplastic scale models. G/W sales engineers say, "Space Control here becomes a reality—one look replaces a thousand words".

Of course successful production of these precision parts requires careful choice of the correct thermoplastics, skillful mold design, dependable press room craftsmanship. These capabilities have gained for Quinn-Berry its enviable reputation as resourceful molders of precision thermoplastic parts—a reputation which invites the unusual. Place your component parts requirements with Quinn-Berry where the Unusual is Routine.

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**2609 WEST 12TH STREET, ERIE, PA.**

CUSTOM MOLDERS OF ALL TYPES OF THERMOPLASTICS

## COMPANIES...PEOPLE

*(From page 252)*

board of **Imperial Chemical Industries, Ltd.** on February 29, 1960. He will be succeeded by **Stanley Paul Chambers**, C.B., C.I.E., a deputy chrmn. since July, 1952.

**Frank S. Gran** elected VP, **The Pantasote Co.**, New York, N. Y., and Passaic, N. J.

**Richard W. Phelps** named gen. mgr. of the **Dilts Div.** of **Black-Clawson Co.**, mfr. of converting machinery for the plastics industry.

**James W. Hendry** will head the machinery development laboratory of **Marbon Chemical Div., Borg-Warner Corp.**, Scottsburg, Ind.

**Richard H. McCarthy, Jr.**, appointed dir. of sales for the **Bradley-Sun Div., American Can Co.** He was previously mgr. of the div.'s Washington, N. J., plant.

**Laurel G. Parkinson** appointed gen. mgr.—marketing of **Amoco Chemicals Corp.**, Chicago, Ill.

**Frederick R. Barlow** joined **Plastic Materials & Polymers, Inc.**, Hicksville, N. Y., as dir. of sales and product development. He was formerly with Celanese Corp. as tech. sales rep. in the Plastics Div.

**Patrick J. Scutella** appointed asst. to **William C. Jenner**, mgr. of the Electrical Insulating Div., **Houghton Laboratories, Inc.**, Olean, N. Y., formulators of epoxy resins.

**Ben Gallers** named sales mgr. of **The Irwin Corp.**, New York, N. Y., mfrs. of plastic toys.

**Theodore F. Wilson** named VP in charge of dinnerware sales, **Prolon Div.** of **Pro-phy-lac-tic Brush Co.**

**Richard Cory** appointed dir. of marketing for **Bostrom Corp.**, Milwaukee, Wis., mfr. of molded urethane foam for office and home furniture upholstery, and vehicle seating.

**Sam Alleva** appointed tech. rep. in the Philadelphia, Pa., and Baltimore, Md., areas by **Claremont Pigment Dispersion Corp.**

**Joseph D. Needles**, previously sales mgr. of the Bell Boy Boat dept., promoted to dir. of the newly-established Marine Div. of **Lunn Laminates, Inc.**

**Gordon B. Lankton**, formerly with Du Pont, appointed sales and tech. engineer for **The Stanley Chemical Co.**, East Berlin, Conn. The company is a subsidiary of **The Stanley Works**, New Britain, Conn.

**Dr. K. O. William Sandberg** appointed exec. VP of **Norton Laboratories, Inc.**, Lockport, N. Y. He was formerly plant mgr. and mfg. mgr. of the Plastics Div., General Electric Co., Decatur, Ill.

**William W. Day** appointed sales mgr. for **Lefco Plastics, Inc.**, Van Nuys, Calif., recently expanded subsidiary of **Poly Industries.**

**Victor H. Weiss** appointed tech. dir. **Ross & Roberts, Inc.**, Stratford, Conn., manufacturers of plastics film and sheeting.

**Noel Burks** appointed sales mgr. of **Plas-Ties Co.**, Santa, Ana, Calif. Plas-Ties are strips of vinyl tape into which a strong wire is imbedded.

**Raymond W. Michaud** named sales rep. for **Improved Machinery, Inc.**, Nashua, N. H., in the south central and southeastern U. S.

**Francis W. Hansell** joined the Philadelphia, Pa., dist. sales staff of **Synthane Corp.**

**Lt. Commander Edmond A. Basquin**, formerly in charge of the U. S. Navy research involving **(To page 256)**


**FREE CABINETS!**
Included at no extra cost with each complete or sectional order of the new DUNDICK DeLuxe Precision Pins

THE PIN WITH A MILLION USES

- Core Pins
- Gages
- Perforators
- Set-up Pins
- 2" Long

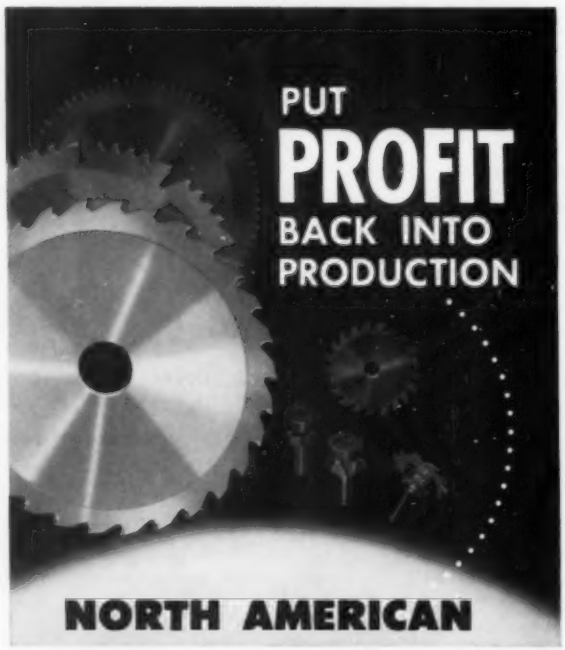
**$1.25** per pin in lots of 10 or more in your choice of sizes.

**721 sizes—from .030 to .750**

**GUARANTEED ACCURACY** within a tolerance of plus or minus fifty millionths

- Each cabinet complete with lacquered hardwood block. Contains properly identified and sized holes to hold pins.
- Heavy-duty all-steel construction.
- Cabinets interlock to form compact unit.

**DUNDICK** TOOL WORKS, INC. 3410 West 31st St. Chicago 23, Illinois

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**CARBIDE TIPPED SAWS & FINISHING TOOLS**

The right tool for the right wood, metal or plastic. Smoother cutting line, no ripping, no chipping. Makes big cuts in replacement and maintenance costs. Write for free catalog today.

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# Naugatuck MARVINOL

## widest, most complete line in the industry!

**Plastisols**—Naugatuck's group of dispersion-grade resins is without peer in the industry. Marvinol® resins for high-shear applications offer the lowest viscosity available anywhere. Other resins for low-shear applications couple extremely low viscosity with excellent air release. Their range of outstanding properties has made Marvinol plastisols Naugatuck's fastest-growing family group.

**Cold dry blends**—Since its introduction of the first homopolymers with high oil absorption in unheated mixers, Naugatuck has been a leader in this field. It now offers the widest range of resins available—covering the widest range of processing conditions.

**Hot dry blends**—Naugatuck has now extended the line to include the lowest molecular weights in the business. The higher weight resins are particularly noted for their excellent electrical properties.

**Specialties**—Long-proved VR-10 and VR-12 are the highest molecular-weight resins of their type produced in this country. They combine high weight, resulting good physicals, and processability as no other resins. Ideal for rigid compounds, they are also frequently used as low-cost partial replacements for dispersion-grade resins, and are particularly valuable for the exceptionally dry hand they impart to plastisols or any vinyl product.

**Copolymer**—Excellent processability at very low temperatures, good heat and light stability with the usual stabilizers, and excellent filler tolerance are features of Naugatuck's resin designed for such applications as phonograph records and asbestos floor tile. Though but recently introduced, this resin is already enjoying widespread approval.

If it's vinyl you want, Naugatuck has it... more and better.

**United States Rubber**
Naugatuck Chemical Division
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**KRALASTIC** RUBBER-RESINS • **MARVINOL** VINYLS • **VIBRIN** POLYESTERS

Akron · Boston · Gastonia · Chicago · Los Angeles · Memphis · New York · Phila. · CANADA: Naugatuck Chemicals · Elmira, Ont. · Cable: Rubexport, N.Y.

(From page 254)

high altitude plastic balloons, has been named director of Divisional Services for the **G. T. Schjeldahl Co.**, Northfield, Minn.

**George D. Selden** appointed New York dist. sales mgr. for the Plastic Container Div. of **Thatcher Glass Mfg. Co., Inc.** The div.'s plant in Nashua, N. H., produces a line of plastic tubes and bottles in both PVC and PE.

Mr. Selden was previously dir.—market & product research for the Extruded Plastics Div. of the Vick Chemical Co.

**James C. E. Fuller** appointed plastic resins sales mgr. of **Naugatuck Chemicals**, div. of **Dominion Rubber Co., Ltd.**, Montreal, Canada.

**G. Edmund Heine** appointed New York, N. Y., sales rep. for **A. H. Wirz, Inc.**, mfrs. of PVC and collapsible metal tubes, plastic containers, and aluminum aerosols.

**Norbert Frosch** appointed mgr. of industrial styling for **Columbus Coated Fabrics Corp.**, Columbus, Ohio. He will be responsible for the styling of Colovin vinyl metal laminates, vinyl upholstery fabrics, case coverings, automotive and marine vinyl fabrics, as well as for other industrial lines.

**Joseph H. Ehrhardt** joined the tech. sales staff of **Artag Plastics Corp.**, Chicago, Ill. He was formerly with Marbon Chemical Div. of Borg-Warner Corp. and The Richardson Co.

**Charles H. Shields, Jr.**, appointed supv. of new product development, **Heyden Newport Chemical Corp.**

**James K. Ames**, formerly central dist. mgr. for the company, appointed to the newly-created position of mgr. —field sales, **Colton Chemical Co.**, a div. of **Air Reduction Co., Inc.** Mr. Ames will headquarter in Cleveland, Ohio.

**William P. Hayes** named to the newly created position of product supt. at **Nosco Plastics, Inc.**, Erie, Pa., custom injection molder.

### New reps.

**Richard A. Knowlton**, North Ferrisburg, Vt., named New England rep. for **Commercial Plastics & Supply Corp.**, to cover N. H., Vt., and northern Mass. . . . **Hercules Packing Corp.**, Buffalo, N. Y., named rep. for **Rogers Corp.**, Rogers, Conn., to handle its reinforced Teflon gasket materials for chemical equipment and processing industries . . . **Chemical Pump & Equipment Corp.**, 3537 Lee Rd., Cleveland, Ohio, appointed sales rep. for **The Ceilcote Co.** for its line of corrosion-proofing materials . . . **Vinyl Plastics, Inc.** adds **Roofing Distributors, Inc.**, 806 21st St., Rockford, Ill., and **Heckman-Eifrig Co.**, 4425 W. Kinzie St., Chicago, Ill., as distributors . . . **Pacific Coast Chemicals Co.**, 2060 Third St., Berkeley, Calif., named by **J. M. Huber Corp.** as exclusive distributor for its kaolin clay extenders and Zeolex synthetic silicate pigments to the plastics, paint, varnish, printing ink, and specialty processing industries in northern Calif. . . . **Almac Plastics, Inc.**, 600 Broadway, New York, N. Y., appointed by **Westinghouse Electric Corp.** as distributor of Micarta laminates and electrical insulation materials in the Eastern U. S. . . . **The Georgia-Pacific Corp.**, 301 S. Kresson St., Baltimore, Md., appointed a distributor for **Formica Corp.** in Baltimore and the surrounding trade areas.

### Correction

"Dual-purpose thermoform." (MPl, July 1959, p. 99). First sentence of third paragraph should read: "All trays are vacuum formed in a 24-cavity mold, using 0.025-in. Midlon high-impact styrene sheet stock supplied by Midwest Plastic Products Co., Chicago Heights, Ill."—**End**

THE LEADING "COMPLETE" LINE OF HOT STAMPING EQUIPMENT
Model No. 3 — For general purpose use (Manual)
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HERCULES NO. 3
NEW UNIFORM SPRING RETURN
Automatic features of most expensive production machines—
1. Foil advance
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Write for Cat. No. 54HS CARRIED IN STOCK
A POWERFUL GENERAL PURPOSE HOT STAMPING MACHINE at LOW COST
Heavy Duty capacity up to 3 tons
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(1) A Complete Unit, easy to install
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SAVES DRYING TIME — CUTS COSTS
A Devine unit DRIES PLASTIC SAFELY, no discoloration danger, DRIES PLASTIC QUICKLY, vacuum drying can cut drying time in half, STORES PLASTIC under vacuum indefinitely. Write for complete details on Plastic Dryers and other products for the Plastics Industry.
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A complete range of shades—from brilliant yellow to deep orange—can be produced with these outstanding pigments. Both Chrome Yellow Medium Y-469-D and Molybdate Orange YE-421-D offer high opacity and excellent blending properties.

These economical pigments also have outstanding lightfastness and they resist migration and crocking. They are suitable in most applications where heat stability is an important factor.

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**REMOVAL SALE—(MOVING TO NEWARK, N. J.) PRICES SLASHED 20 TO 50%:** 1—Baker Perkins 100 gal. Sigma blade Mixer; 1—Baker Perkins size 16 TRM, 150 gal. double arm, Vacuum Mixer; 1—Rotary Cutter; 1—Kent 6" x 14" three roll mill; 6—Stokes Model DD2, DS3, and B2 Rotary Preform Presses; 4—Stokes Model "R" single punch Preform Presses. Also: Sifters, Banbury Mixers, Powder Mixes, etc., partial listing: write for details; we purchase your surplus equipment. Brill Equipment Co., 2407 Third Ave., New York 51, N. Y.

**MOST MODERN PACKAGING AND PROCESSING MACHINERY**
Available At Great Savings.
Package Machinery, Hayssen, Scandia, Wrap King, Campbell, Miller Wrappers. Pneumatic Scale Automatic Carton Feeder, Bottom Sealer, Wax Liner, Top Sealer with interconnecting Conveyors. Pneumatic Scale Tite Wrap. Fitzpatrick Models D and D-6 Stainless Steel Comminuters. Baker Perkins and Day 50 and 100 gal. Steam Jacketed Stainless Steel and Steel Double Arm Mixers. Day, Robinson 50 to 10,000 lbs. Dry Powder Mixers, Jacketed and Unjacketed. Werner & Pfleiderer 3,000 gal. and 3,500 gal. Jacketed Double Arm Mixers. Mikro Pulverizers, Models 1SH, 2TH, 3TH and 4TH. Colton 2RP, 3RP, 3B, 5½ T Tablet Machines. Stokes DD2 and Eureka Tablet Machines. Standard Knapp, A-B-C, Ferguson Carton Sealers. Union Standard Equipment Company, 318 Lafayette Street, New York 12, N. Y. Phone: Canal 6-5334.

**FIRST CLASS EQUIPMENT FROM YOUR FIRST SOURCE:** Unused F-B. 2 Roll Plastic or Rubber Mills, 14" x 30" complete; Baker Perkins Heavy Duty Jktd Mixers up to 500 Gal.; Special 300 Gal. Stainless Vacuum Mixers, Sigma Arms; Bot. discharge; 250 Ton Self Contained Laminate Press; F.-B. 3 Roll Calender 8" x 16" compl; Preform Presses, Rubber Cutters etc. First Machinery Corp., 209 Tenth St., Brooklyn 15, N.Y. Phone ST-8-4672.

**FOR SALE:** Complete moulding equipment for producing expanded polystyrene blocks measuring approximately 9" x 18" x 36" also hot-wire cutter for the same. Reply Box 5922, Modern Plastics.

**NEW STAUDE AUTOMATIC ACETATE BOX MACHINE:** Sacrifice for cash or easy terms to responsible party. Will trade for slitter or other plastic fabricating machinery. Reply Box 5923, Modern Plastics.

**FOR SALE:** 43—Baker-Perkins #17, 200 gal. jacketed mixers, sigma and duplex blades, many with individual 30 HP motors and drives, power-screw tilts. 2—Baker-Perkins 100 gal., sigma or dispersion blades, jacketed. 3—Baker-Perkins 50 gal., sigma blades, jacketed. 2—J. H. Day 35 gal. sigma blade. Perry Equipment Corp., 1429 N. 6th St., Phila. 22, Pa.

**FIBERGLASS MOLDING EQUIPMENT:** 100 ton Hydraulic Press (L&F Press Frames) 36" x 48" Platens; 200 ton Hydraulic Press (L&F Press Frames) 48" x 72" Platens; 100 ton HPM Press 36" x 48"; 30" Brenner Rotary Preformer; 36" Brenner Rotary Preformer; 36" Brenner Stationery Preformer; Fuel Engineering Preform Curing Ovens; Miscellaneous Mixing and Handling Equipment. Reply Box 5914, Modern Plastics.

**FOR SALE:** The only Baker Perkins Mixer on the used market, with jacket on 4 sides, & cored sigma arms, size 15 or 100 gals. working cap., with motor & drive. Equipment Clearing House, Inc., 111 33 Street, Brooklyn 32, N.Y. SOuth 8-4451.

**FOR SALE:** 2 Youngstown Miller "YM" plasticoaters, model 40-20 for melting up to 60 lbs. per hour of plastic. Dip compartment 18 x 30 x 18" deep. Reply Box 5909, Modern Plastics.

**FOR SALE:** Injection Molding Machines for release after November 30th. 1950 Watson Stillman 16 ounce; 1950 Watson Stillman 12 ounce; 1946 Reed Prentice 6 ounce; 1946 Reed Prentice 8 ounce. May be seen in operation at Franklin Plastics, Franklin, Penna.

**FOR SALE:** Fellows 8 oz. molding machine, new in 1955. Low pressure closing. Leeds & Northrup instruments. Has been well maintained and is in excellent running condition. May be seen in operation. Sterling Plastics Co., 1140 Commerce Ave., Union, New Jersey.

**FOR SALE:** 1—4½" Hartig Extruder, all equipment, 50 Hp motor, complete, prewired cabinet. Can be seen in operation, 2 yrs old, excellent condition, extra long barrel. Hartig Pelletizer complete with extra rollers and equipment. All offered at a considerable savings. Reply 5913, Modern Plastics.

**FOR SALE:** 2000 ton 6-Opening Press, steam platens 12' 9" x 7' 6" with Pump Unit. 2000 ton 6-Opening Press, platens 60" x 40". 900 ton 10-Opening Press, steam platens 96" x 48" with self-contained Pump Unit. Reed Brothers (Engineering) Ltd., Replant Works, Woolwich Industrial Estate. London S.E. 18. Telephone: Woolwich 7611/6. Cables: Replant, London.

**FOR SALE:** Progressive Film Batcher, 48" wide, complete with Servospeed drive and automatic controls. Never used. Also, sizable quantity of new NRM extruder feed screws. Magee Plastics, P.O. Box 2615, Akron 1, Ohio.

**FOR SALE:** 1—Farrel 6" x 12" Laboratory Mill complete. 1—00 Farrel Banbury Mixer. 1—5 gal. Baker Perkins Mixer complete. 7—French Oil 200 ton Plastic Molding Presses. Down acting ram with pullbacks. Platen area 24" x 30". Brewster Rubber Machinery Company, 349 East Exchange St., Akron 4, Ohio. P.O. Box 825. FRanklin 6-2911.

**FOR SALE:** 6—New Farrell Birmingham 14" x 30" two roll Mills. Watson Stillman 240 ton, ten 24" x 56" platens. Baldwin-Southwark 200 ton semi-automatic transfer molding press. French Oil 250 ton 36" x 28". 225 ton 10" record presses. French Oil 120 ton self-contained. Hydraulic pumps and accumulators. New ¾ oz. Bench Model Injection Machines. Van Dorn 1 to 2½ ounce. Lester 16 oz. Other sizes to 100 oz. Baker-Perkins and Day jacketed mixers. Ball & Jewell #2 Plastic Grinders and other sizes. Seco 6" x 12" and 8" x 16" mills and calenders. Hartig 3¼" Plastic Extruder. Single and Rotary preform presses ½" to 4". Partial listing. We Buy Your Surplus Machinery. Stein Equipment Company, 107-8th Street, Brooklyn 15, New York.

**SPECIAL THIS MONTH:** 30" dia. upmoving ram press. Ten 37" x 37" steam platens; rated at 1000 Ton. 485 Ton Francis Press; 128" R to L x 52" F to B. Injection Molding Machines: Reed Prentice 8 oz., Reed Prentice 12 oz., Watson-Stillman 12 oz., HPM 16 oz., Lester 4 oz., Van Dorn 1 oz. Scrap Cutters in all sizes; Ball & Jewel and Cumberland No. 1½'s. WE WILL FINANCE. Johnson Machinery Company, 683 Frelinghuysen Ave., Newark 2, New Jersey. Bigelow 8-2500.

**FOR SALE:** 6—Farrel Birmingham 14" x 30" plastics mills; 2—compression molding presses, 40 and 200 tons; 1—MPM 2½" electrically heated extruder; 1—Cumberland 7" stair step dicer; 3—ribbon blenders, 1000, 1500 and 2000# capacity; also preform presses, mixers, presses, etc. Chemical & Process Machinery Corp., 52 9th St., Brooklyn 15, N.Y. HY 9-7200.

**CALENDER:** Farrel 2-Roll, 10" x 17". Extruders: NRM 1½". Complete Plastic Wire Coating Unit; NRM 2" Electric Heated; Hartig 3¼" Electric Heated, 20 HP, Reliance VS Drive; Royle 3¼", 15 HP Vari-Drive; Royle 4½"; Adamson 8". Injection Machines: Reed-Prentice 16 oz., Watson-Stillman 24 oz. Hydraulic Presses; Watson-Stillman 10-55 Ton; Loomis & Francis 40 Ton 4-opening; Watson-Stillman 75 Ton, Semi-Auto., Self-Contained (2); Baldwin-Southwark 100 Ton, 12-Opening; HPM, Southwark & Watson-Stillman 100 Ton; Elmes 200 Ton; HPM 300 Ton; Watson-Stillman 300 Ton Transfer; Farrel 625 Ton; Clearing 1500 Ton; Robertson 350 & 700 Ton Hobbing. Pelletizers, Preheaters, Scrap Cutters. Tablet Machines, Mills, Mixers, Banburys, Boilers, Machine Tools, etc. Hochman Plastics Machinery Corporation, 151-P Mulberry St., Newark, New Jersey. Mitchell 3-8430.

**FIFTY LATTNER BOILER** dealers throughout the country have used and like new automatic steam boilers for sale. Small sizes ½ to 35 H.P. Gas, oil or electric fired. Write for name of dealer near you. Lattner Mfg. Co. Cedar Rapids, Ia.

**FOR SALE:** H.P.M. Rubber Injection molders, 21½" x 28" mold space, steam heated platens. Watson-Stillman 300 ton semi-automatic compression molding press (1947) self-contained mold size 34"x27". Watson-Stillman 250 ton 28"x24". Watson-Stillman 140 ton 22"x16". Waterbury Farrel 85 ton 20"x24". Laboratory presses—15 ton 10"x8" and 10 ton 6"x6" platens. (1) 8 ounce Lester Phoenix Injection Molder (late) with nylon attachment. Scrap cutters. Presses—all sizes. Aaron Machinery Co., Inc., 45 Crosby St., New York, N.Y. Tel.: WAlker 5-8300.

**LIQUIDATION PLASTICS PROCESSING PLANT:** Allsteele chunk grinder, 75 HP; Foremost granulator, 50 HP; 6000# ribbon blender; 80 HP package boiler; Entoleter impact mill; 6" x 12" lab mill; Preco 20 ton lab press; sifters, conveyors, scales, etc. Write or wire Chemical & Process Machinery Corp., 52 9th St., Brooklyn 15, N. Y., Phone Hy 9-7200.

**FOR SALE:** One 32 oz. HPM machine, approximately 5 years old. In excellent operating condition, used very little. Price $25,000. Reply Box 5934, Modern Plastics.

**POWDER BLENDERS:** 10,000 lbs. Lab. Mill 6 x 16. Baker Perkins 150 gal., 2 arm, 40 HP; 100 gal., 2 arm, 50 HP, S. S. jacketed vacuum hydr. tilt. Stokes—3 DDS2, 1 DS3, 1 R, 1 S, 1 T. Calender 6 roll 5" x 12". 1,000 ton Hobbing Press. Ball Mill. Hyd. Pumps. Machinecraft Corp., 800 Wilson Ave., Newark 5, N. J. —Mitchell 2-7634.

**FOR SALE OR LEASE PLASTIC MOLDING MACHINES.** 2—Watson-Stillman 60 oz. Inj. Molding Press 1—Reed-Prentice 32 oz. Inj. Molding Press. 1—Watson-Stillman 28 oz. Inj. Molding Press. Dover Molded Products Co., Dover, Ohio. Phone 4-2172.

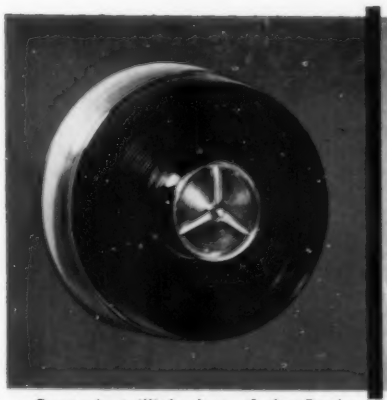
## Machinery wanted

**WANTED TO BUY:** Used injection molding machines, oven, granulators. One machine or complete plant. Acme Machinery & Mfg. Co. Inc., 20 South Broadway, Yonkers, N.Y. YOnkers 5-0900, 102 Grove Street, Worcester, Mass., PLeasant 7-7747, 5222 West North St., Chicago, Illinois, TUxedo 9-1328.

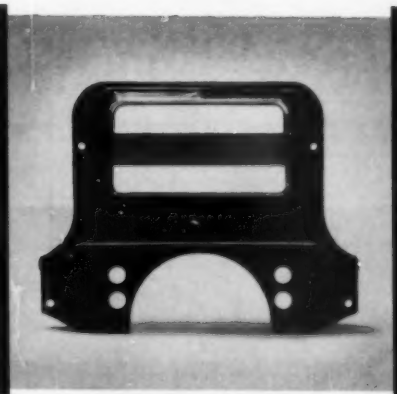
*(Continued on page 260)*

The Automotive Market...
High style Mercury taillight lens is achieved through vacuum metallizing on second or inside surface.

# Hit this New Sales Jackpot with VACUUM METALLIZING



Dramatic taillight lens of the Ford Thunderbird utilizes vacuum metallizing on inside surfaces.



Metal rim effect created through metallizing on instrument panel on Bonanza Airplane by Beechcraft made by metallizing.

New light weight metallized plastic arm rest on Pontiac, Buick and reflector on rear arm rest of Chevy's Impala, are less expensive than metal, look better.

Help Detroit win the battle against costs and weight and you'll bring home the sweetest slice of business you ever saw! And you can do it with vacuum metallized plastics!

Take a peek at the Mercury or Thunderbird taillights, the new arm rests for the Buick and Pontiac, or the smart backup plate on the Impala arm rest and see if these examples don't stimulate your imagination. It may also be worth your while to look over the instrument panel or aircraft interiors and chalk up another market with boundless opportunities for sales.

Best of all, you don't have to know anything about vacuum metallizing to get started. Buy the equipment from us; we will install it, train your operators, and help you set up a production operation.

Send us a sample part and we will finish it FREE. We will also estimate the cost per piece without obligation. Will you ship today?

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(Continued from page 258)

**WANTED TO BUY**—Used 4½ or 6 inch extruder or 20/1 length over diameter ratio with P.E. of PVC screw. Please send price, location & complete specifications plus date of mfg. Reply Box 5927, Modern Plastics.

## Materials for sale

**GENERAL PURPOSE, MEDIUM AND HI-IMPACT POLYSTYRENE AND POLYETHYLENE** molding materials for sale in any color or quantity. Packed in 50 lb. bags. Now at our lowest prices in years. For top quality materials, at big savings, write: Gering Plastics division of Studebaker-Packard Corp., Kenilworth, New Jersey, Department M. Or call: (N.J.) BRidge 6-2900.

**REPROCESSED NYLON FOR SALE:** Reprocessor offers highest quality pelletized nylon in all common resin types. Natural and black available from stock. Custom colors compounded on request. Samples and quotations promptly furnished. Adell Plastics, Inc., 5208 Eleanora Avenue, Baltimore 15, Md.

**FOR SALE**—50,000 lbs. polyethylene pellets grade A natural, very low price. Rapid Industrial Plastics Co., 380 Flushing Avenue, Brooklyn, N.Y. Ulster 5-2850.

## Materials wanted

**WANTED:** All types of plastic scrap and surplus inventories such as: styrenes, butyrates; acetates, acrylics and polyethylenes in any form. Write, Wire or Phone Collect. Humboldt 1811. Philip Shuman & Sons, 15-33 Goethe Street, Buffalo 6, New York.

**WANTED:** Plastic of all kinds—virgin, reground, lumps, sheet and reject parts. Highest prices paid for Styrene, Polyethylene, Acetate, Nylon, Vinyl, etc. We can also supply virgin & reground materials at tremendous savings. Address your inquiries to: Gold-Mark Plastics Compounds, Inc., 4-05 26th Ave., Long Island City 2, N. Y. RAvenswood 1-0880.

**GET THE TOP MONEY FOR PLASTIC SCRAP:** Now paying top prices for all thermoplastic scrap. Wanted: polystyrene, cellulose acetate, vinyl, polyethylene, butyrate, acrylic, nylon. All types and forms including rejects and obsolete molding powders. Fast action wherever you are located. WRITE, WIRE TODAY! Reply Box 5921, Modern Plastics.

**WANTED:** Vinyl and Polyethylene Scrap. Send description and small sample. We are continuous buyers. American Vinyl Corp., 73-30 Grand Ave., Maspeth 78, N.Y. Tel.: DEfender 5-9200.

**POLYETHYLENE WANTED**—will purchase virgin, scrap, and off grade polyethylene, natural and colors in injection molding and extrusion grades. In reply, state price, melt index, quantity available and shipping point. Reply Box 5924, Modern Plastics.

**NYLON SCRAP WANTED:** by reprocessor. All kinds including molding, extrusion and fabricating. Quotations promptly furnished on all grades and polymer types. Adell Plastics, Inc., 5208 Eleanora Avenue, Baltimore 15, Md.

**WANTED:** Plastic scrap. Polyethylene, Polystyrene, Acetate, Acrylic, Butyrate, Nylon, Vinyl. George Woloch, Inc., 514 West 24th Street, New York 11, N. Y.

**POLYETHYLENE & VINYL SCRAP WANTED.** Top prices paid for all types and forms. Write or Wire today! Kent Plastics, 830 Monroe St., Oldfield 6-2020, Hoboken, N.J.

## Molds for sale

**ONE 8 CAVITY MOLD** for little girl's high heel play shoes. Interchangeable cavities produce two pair per 8 oz. shot in three sizes. Like new at a fraction of our cost. Reply Box 5916, Modern Plastics.

**SHOE MOLDS FOR SALE.** Sandal type shoe small, medium, large injection molded-vinyl for immediate production. Market tested. Cooperative ventures entertained. Reply Box 5928, Modern Plastics.

**COMPLETE TOOLING** for reinforced plastic Hawaiian type surfboard. $28,000. 95 in. long, 24 in. wide, weight 35 lbs. U. S. Patent No. 183,016. Electric heated Aluminum Matched Molds. Bulkhead Molds, Ass'y fixture Model, Patterns and Mfr. technique. Write, Fibre Lite Products Co., 20409 Fenton, Roseville, Michigan.

## Help wanted

**PERSONNEL:** Executive—Technical—Sale—Production. Employers and Applicants—whatever your requirements, choose the Leader in Personnel Placement. Cadillac Associates, Inc., Clem Easly—Consultant to Plastics Industry, 29 E. Madison St., Chicago, Ill.—Wabash 2-4800. Call, write or wire—in confidence.

**PRODUCTION MANAGEMENT OPPORTUNITIES:** Expanding Division of multi-plant national company, offers unusual opportunities in film extrusion engineering, plant supervision, quality control, flexographic and rotogravure printing, machine designers. These are growth positions for responsible, ambitious men with America's Oldest Bag Maker. Reply to: Plastics Division, Chase Bag Company, 155 East 44th St., New York 17, New York.

**SALES MANAGER POSITION AVAILABLE:** Established, nationally distributed line of plastic pipe and fittings. Determine sales policies, supervise commission sales agents, prepare advertising, etc. Onportunity for man who can grow. Reply Box 5912, Modern Plastics.

**VINYL FILM CHEMIST:** Large plastics firm located in the East seeks a vinyl film chemist thoroughly familiar with all types of unsupported vinyl film formulations and method of manufacturing same to act as its consultant. The man we want must have approx. 10 years' experience in this field. He should have full knowledge of plasticizers (both monomeric and resinous) and their effect on various polyvinyl chloride resins and the resultant films that can be produced. Your resume will be held in strictest confidence. Our employees know of this ad. Reply Box 5906, Modern Plastics.

**MOLDING FOREMAN-SET-UP MAN:** Small, progressive plant in Long Island City, needs capable man, excellent opportunity and permanent benefits. Reply Box 5918, Modern Plastics.

**PLASTICS ENGINEER**—Mechanical engineer with minimum of five years' experience in processing of thermoplastics. Extrusion experience desirable. Must be able to design equipment, supervise experimental work and analyze data. Technical report writing ability necessary. Please send detailed resume including education, experience and salary requirements to: E. R. Patterson, Employment Manager, Olin Mathieson Chemical Corporation, New Haven, Connecticut.

**WANTED:** Representative to solicit Custom Molding for large New England Plastic Manufacturer of injection molding and Vinyl molding items. Send complete resume of background. Reply Box 5919, Modern Plastics.

**BLOW MOLDING OPPORTUNITY**—New division of established company needs man to train personnel and take complete charge of operation. Loma Plastics, Inc., P. O. Box 11271, Fort Worth, Texas.

**PLASTICS CHEMIST:** Experienced man, with broad background in plastics, required for group leader in modern plastics development and quality control laboratory. Familiarity with glass reinforcements, resins, pigments and all physical testing procedures will be required. Proven leadership ability is a requisite. A minimum of five years experience is essential. Furnish complete background data in first letter. All information will be considered confidential. Location in Southern Ohio. Reply Box 5900, Modern Plastics.

**PRODUCTION SUPERVISOR:** We require the services of a man who is thoroughly familiar with all phases of high production reinforced plastic molding operations. Applicants should have proven capability to handle men and should have 5-10 years of recognized experience in plastic molding. Application should include full experience record and salary required. Plant located in Ohio. Reply Box 5901, Modern Plastics.

**PLANT ENGINEER:** To assume responsibilities for maintenance, installation and repairs on all equipment in modern reinforced plastic molding plant. Experience with hydraulic and electrical systems essential and familiarity with preforming and molding equipment desired. Location mid-west. Submit resume, salary requirements and availability. Reply Box 5902, Modern Plastics.

**TOOL DESIGNER:** Well established, growing proprietary molder is seeking man experienced in injection mold design. Knowledge of modern molding equipment and plant engineering desirable. Excellent permanent position. Plant located in New York Metropolitan area. Send complete resume with salary requirements. Reply Box 5904, Modern Plastics.

**SALES REPRESENTATIVES WANTED:** Parent corporation has openings on a national basis for established authorized manufacturers' representatives on strict commission basis in various divisional organizations. 1. **Durable Formed Products, Inc.** Sales representatives wanted for custom vacuum-forming sales. 2. **Air-O-Flow Industries, Inc.** Agents wanted who specialize in sales of plastic machinery to sell automatic thermoforming equipment. 3. **Techni-Plastics, Inc.** Specialized sales for custom acrylic work, edge-lite panels, dials and knobs. Indicate territory you cover. Write to: Durable Industries, Inc., Chemical Corn Exchange Bldg., 74 Varick Street, New York 13, New York.

**CHEMIST:** To supervise section of Research & Development Department. Should be experienced in: 1) Thermoplastic and thermo-setting resin formulation and use. 2) Reinforcing plastics application and testing. Should have a B.S. degree in Chemistry or higher. This position offers an excellent opportunity for future advancement. Send resume and salary requirements to Chief Engineer, Famco, Incorporated, P. O. Box 117, Louisville 9, Kentucky.

**EXCEPTIONAL OPPORTUNITY WITH GROWING COMPANY . . .** The leader in its Field . . . for a Chemist or Chemical Engineer to head development of Molding Compounds. 4 to 7 Years Experience. Some experience in thermosetting molding compounds essential. Epoxy and Silicone Technology helpful. Full Insurance, Profit Sharing, & Retirement Programs. Northeastern U.S.—Non Metropolitan area—Ideal for Family living. For a confidential interview, send resume of experience and salary requirements. Reply Box 5905, Modern Plastics.

**EXTRUSION SUPERINTENDENT:** Man with thorough knowledge and experience in set-up and production of extruded shapes wanted for permanent position with well-established proprietory extruder on West Coast. Ability to design dies and to handle personnel a must, shop administration only, all new equipment, complete tool room and maintenance facilities on premises. Assistance would be given in relocation. Subordinate positions also open. Submit complete details, salary expected, etc. All replies confidential. Reply Box 5903, Modern Plastics.

(Continued on page 262)

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in engineered thermoplastics

GRC
now producing
tiny parts in
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DuPont's new acetal resin, DELRIN, with mechanical properties equalling metals in many ways — while excelling in corrosion-resistance, resilience, non-conductivity, and other important factors, is NOW available from Gries in tiny parts engineered to precision tolerances.

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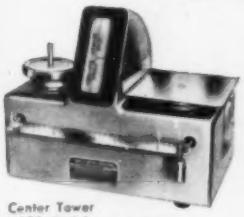

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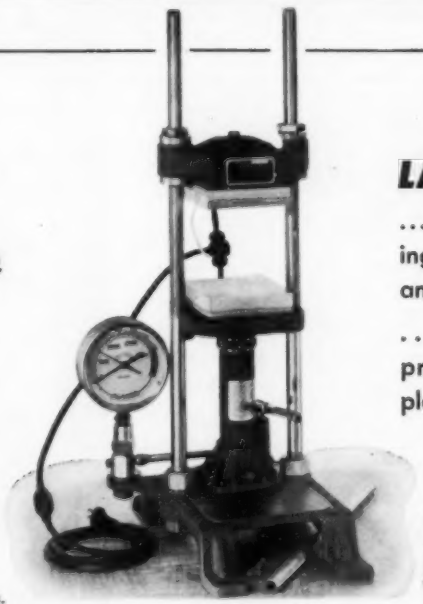

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*(Continued from page 260)*

**PRODUCT ENGINEER—PLASTICS:** No degree necessary, knowledge molds and cost estimating. To figure items from inception to completion, and how best to produce economically. Familiar jigs, fixtures and mechanization. Reply Box 5907, Modern Plastics.

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**PRODUCT DEVELOPER—TOYS:** To handle items from ideas submitted to him to their completion. Must know molds, estimating costs with an eye for economical production. Knowledge packaging helpful. Reply Box 5908, Modern Plastics.

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**EXTRUSION ENGINEER:** Experienced in technological phases of thermoplastic extrusion. A challenging, responsible, position involving developmental work and research to improve existing facilities. Growth potential excellent with prominent midwest concern. Salary commensurate with experience and ability. Relocation allowance. Furnish complete resume. Reply Box 5910, Modern Plastics.

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**MARKET DEVELOPMENT — POLYSTYRENE**—1. Do you have 7 or more years experience in polystyrene (or polystyrene and polyolefin) technical service or market development work? 2. Do you have a B. S. degree? 3. Do you have a "sales" type of personality? 4. Are you interested in an opportunity to grow with a dynamic, youthful organization? If you can answer yes to all 4 of these questions, you may be just the man we're looking for. Write and send your detailed resume to G. A. Ritter, Employee Relations Coordinator, Amoco Chemicals Corporation, 910 South Michigan Avenue, Chicago 80, Illinois.

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**MARKET DEVELOPMENT SPECIALIST**—To assume responsibility for determining product and application needs, recommending and directing progress on new development projects, and technical selling on a professional plane to all customer levels of the electrical insulation industry. We are manufacturers of reinforced plastics electrical insulation. Send resume to: Fiber Glass Industries, Inc., Homestead Place, Amsterdam, New York.

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**PLASTICS TECHNOLOGIST**—An expanding division of Harshaw Chemical has an opening in Technical Sales/Service and field application work in paints and plastics. Some practical working knowledge of thermoplastic field and paint field is necessary. Chemical background preferred. This is a new position creating a real opportunity for individual growth. Please send details of education, experience and salary requirements. All inquiries will be handled promptly and held in confidence. D. E. Hyde, The Harshaw Chemical Co., 1945 E. 97th St., Cleveland 6, Ohio.

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**REPRESENTATIVES WANTED:** for the foremost manufacturer of die cutting equipment which trims a practically unlimited amount of rule of plastic or plastic-like materials. Additional products include: packaging machinery now making the most successful blister packages. Our machines can meet the requirements of small or large production. Various territories open throughout the United States. Send us a complete resume outlining experience, other lines, & following. Reply Box 5925, Modern Plastics.

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**MOLD DESIGNER**—Experienced in the complete design and lay-out of plastic compression, injection and transfer molds. Progressive company. North suburb of Chicago. Excellent salary for top designer. Reply Box 5930, Modern Plastics.

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**APPLICATIONS GROUP LEADER:** Chemical Engineer or Chemist to manage Technical Service laboratory for nationally known PVC producer. Previous experience required. This key position is permanent, involves limited traveling. Our employees have been notified. Reply in confidence to: Holton & Roche, 230 Park Avenue, New York 17, N. Y.

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**CUSTOM EXTRUDER** of plastics desires additional salesmen (commissioned manufacturer's reps) in all regions of U.S. Reply Box 5935, Modern Plastics.

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**WANTED**—Top flight thoroughly experienced Engineer with complete knowledge of extrusion techniques. Blowing experience desirable. Offering good salary, good incentives. Opportunity for bright future. Reply Box 5936, Modern Plastics.

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SALES AND SERVICE REPRESENTATIVES FOR INTERNATIONAL SALES DIVISION—An internationally known U.S. manufacturer of thermoplastics has several new position openings for sales and technical service representatives in its international sales division headquartered in Switzerland. Excellent opportunities to engage in product sales or customer service functions in European markets representing a major American industrial corporation. Exceptional prospect for future promotion. Applicants for either position must have a technical education or a minimum of 3 years related experience in the thermoplastics indusrty. Must speak English fluently. French or German also essential. Please submit resume of education and experience, including current salary. All replies treated confidentially. Interviews will be conducted at convenient European locations during October. Reply Box 5938, Modern Plastics.

## Situations wanted

**CHEMIST:** Experienced in research and development of adhesives and coatings based on polymers, elastomers, epoxies, synthetic resins. Structural adhesives, pressure-sensitive tapes. Developed laminants for plastic films, foils, paper, fabrics, plastic and latex foam. Latex solvent systems. Lab and production supervision. Conscientious, cost conscious, fully responsible. Seeks challenging position with growth potential. Reply Box 5917, Modern Plastics.

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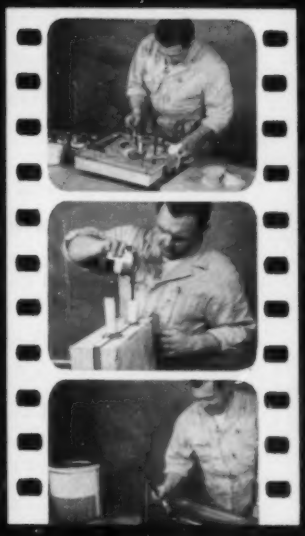

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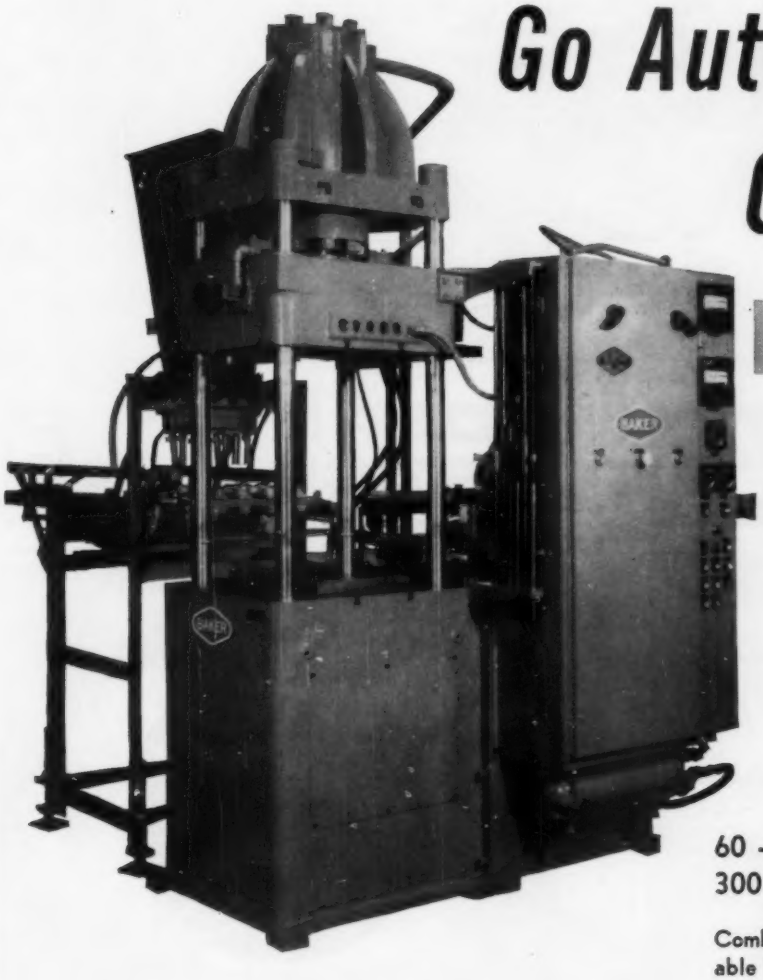

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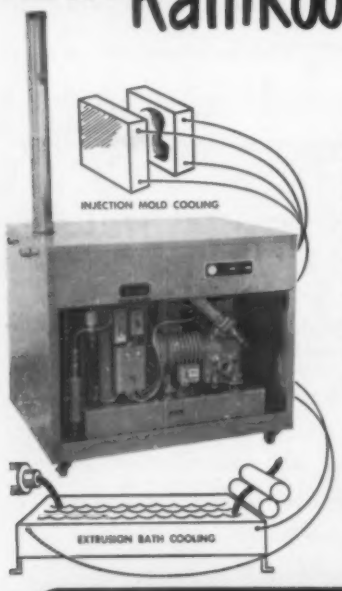


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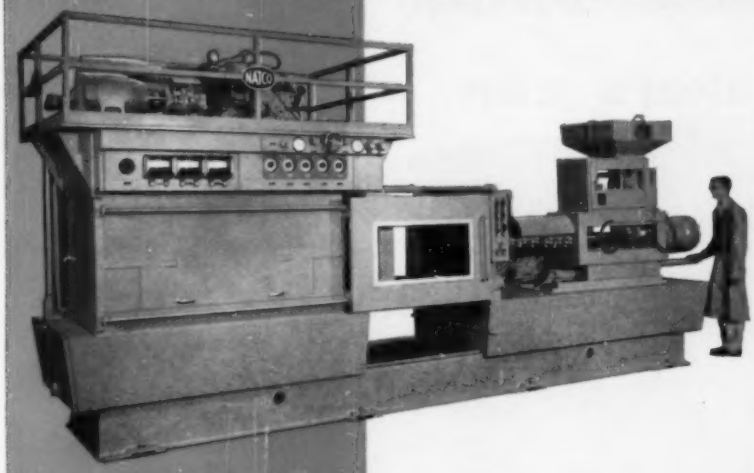

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# EDITORIAL

## PE film makers can learn from cellophane

Buck-passing is germane to all industries, and the more complicated the industry in terms of the number of people involved at all levels, the more prevalent this habit is.

At present there are a dozen makers of film-grade polyethylene and somewhere between 80 and 100 polyethylene film extruders, there are a score of makers of machines designed to package things with this film—either adaptations of machines made to handle other films such as cellophane, or new machines designed exclusively for polyethylene. Finally, there are thousands of companies owning packaging machines and buying film to use on them. Perfect for buck-passing!

At material-maker level there are strong engineering-sales-service facilities; this extends generally as far as the extruder and in some cases even beyond. At film-maker level a few companies have such service facilities to help film users; many do not. The machinery people generally are quite thorough in engineering-sales-service activity.

So material makers compete to sell their resins to the film extruders, and the film extruders compete to sell their films to the packagers who run them through the packaging machines. At any point between resin maker and end user can come grief and an opportunity for buck-passing.

Twenty-five years ago cellophane had somewhat the same problems except that then there were only two makers (only three today). These makers were big enough to provide the research and engineering-sales-service facilities to develop standards of perfection and battle for the markets with papers.

Before the National Bureau of Standards right now is an S.P.I.-Sponsored recommended commercial standard for polyethylene film, TS-5438. It isn't perfect, but it is at least a quality platform from which further progress may be made.

All parties concerned—materials people, film producers, distributors, packaging machinery companies, and users—have been contacted. A meeting will be held in Washington on September 17 to resolve and finalize proposed changes.

PE film generally has a long way to go to reach cellophane's present perfection in gage, sealing, and handling qualities. Because so few companies pioneered cellophane, liaison at all levels was easy. The PE film makers must do it the hard way. The only way to do it is to build stringent standards and revise them upwards as techniques improve.

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# "THE GENERAL ELECTRIC PHENOLIC COMPOUND GAVE US SUPERIOR MACHINABILITY AND CUTOFF"

***That's what Jim Callihan, sales manager for the Plastics Division of the General Industries Company, Elyria, Ohio, says of G-E 12920 general purpose phenolic molding powder.***

Good machinability and cutoff were essential if the part shown here was to be produced at an economical rate and with a minimum of rejects. Test runs demonstrated that *G-E 12920* provided both.

This compound is but one of many General Electric phenolics that today are doing high-specification molding jobs. Performance — in molding and in use — is the key to the extra values offered by G-E molding powders.

Check out these extra values yourself the next time you have a critical job to do. The G-E representative will help you select the right phenolic for your purpose. For technical data and other information, write General Electric Company, Section MP-99, Chemical Materials Dept., Pittsfield, Mass.

*Phenolics-first of the modern plastics ...first in value*

GENERAL ELECTRIC